THE JOURNAL OF GAS LIGHTING
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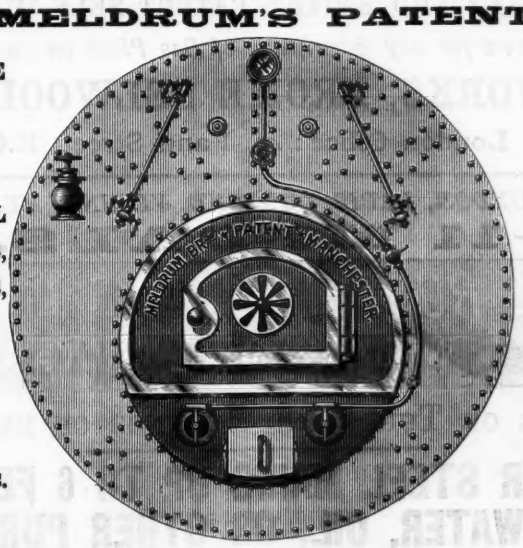

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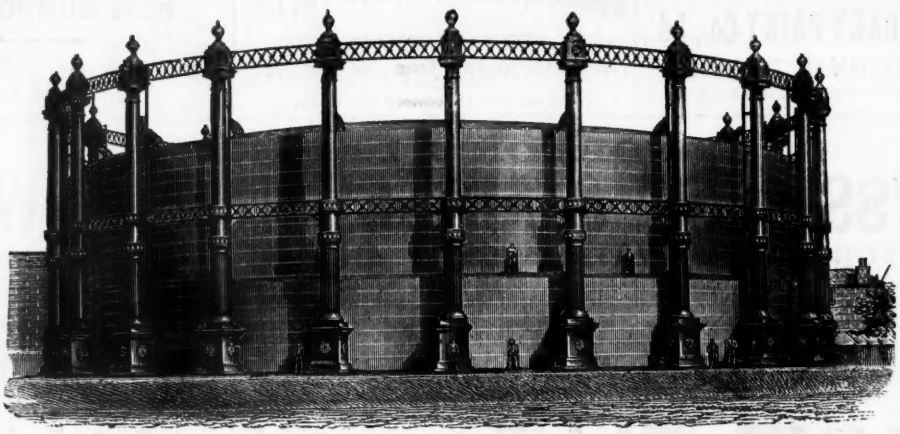

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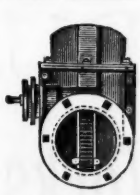

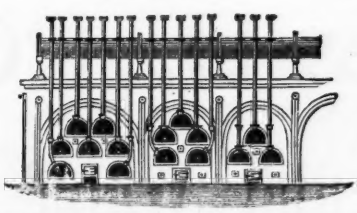

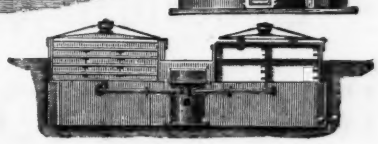

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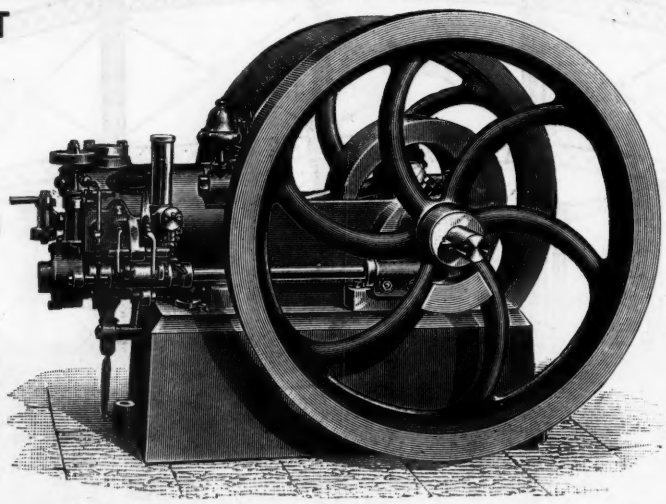

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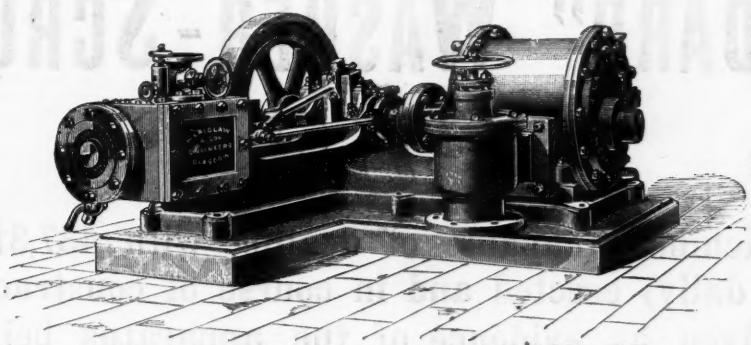

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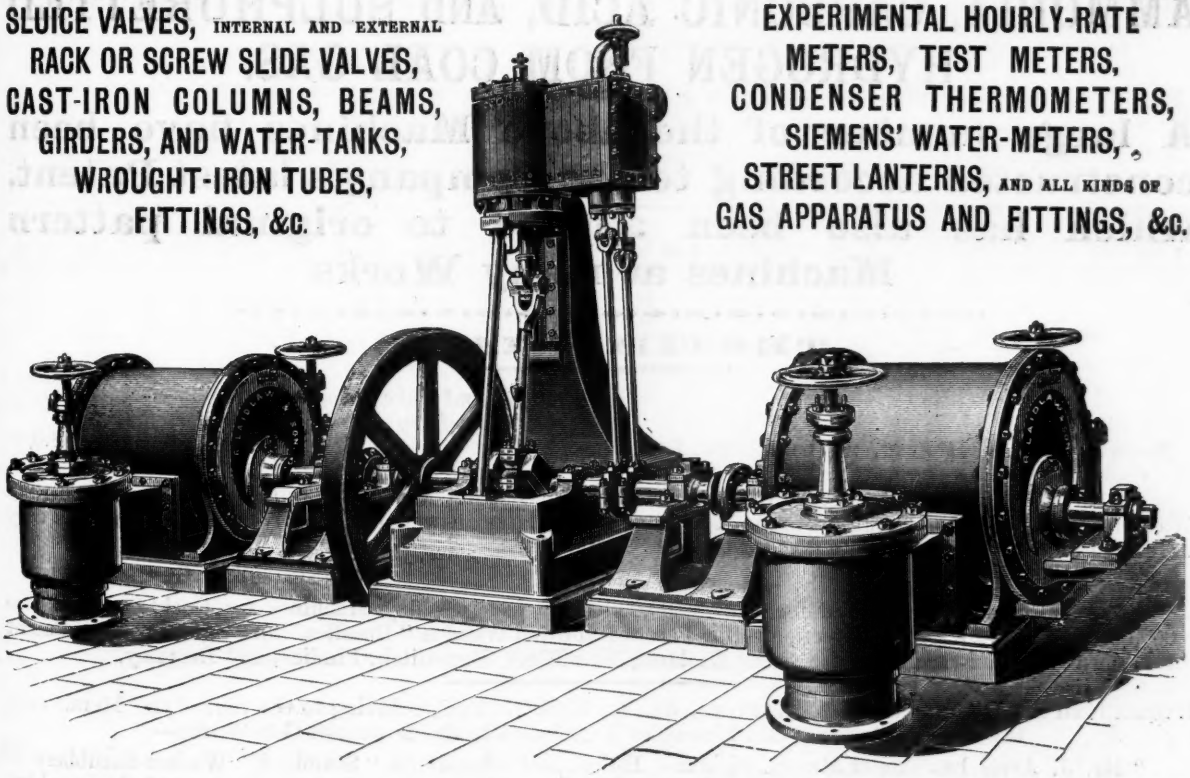

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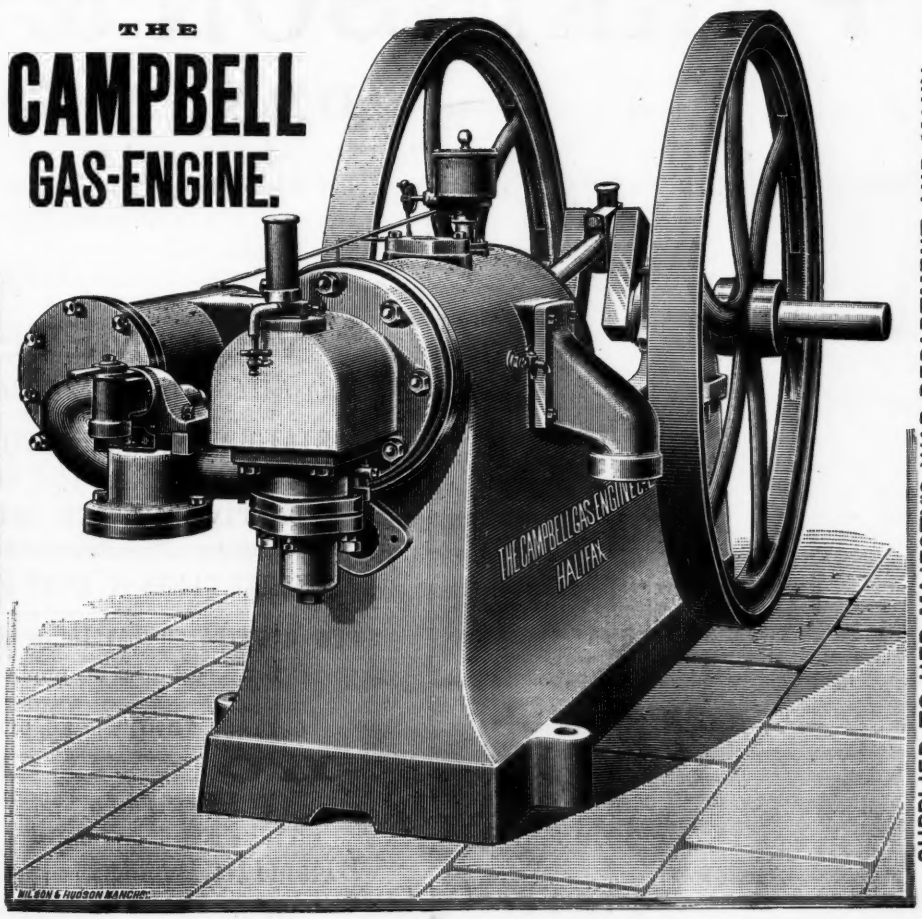

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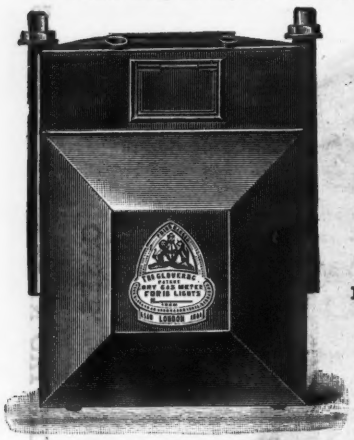

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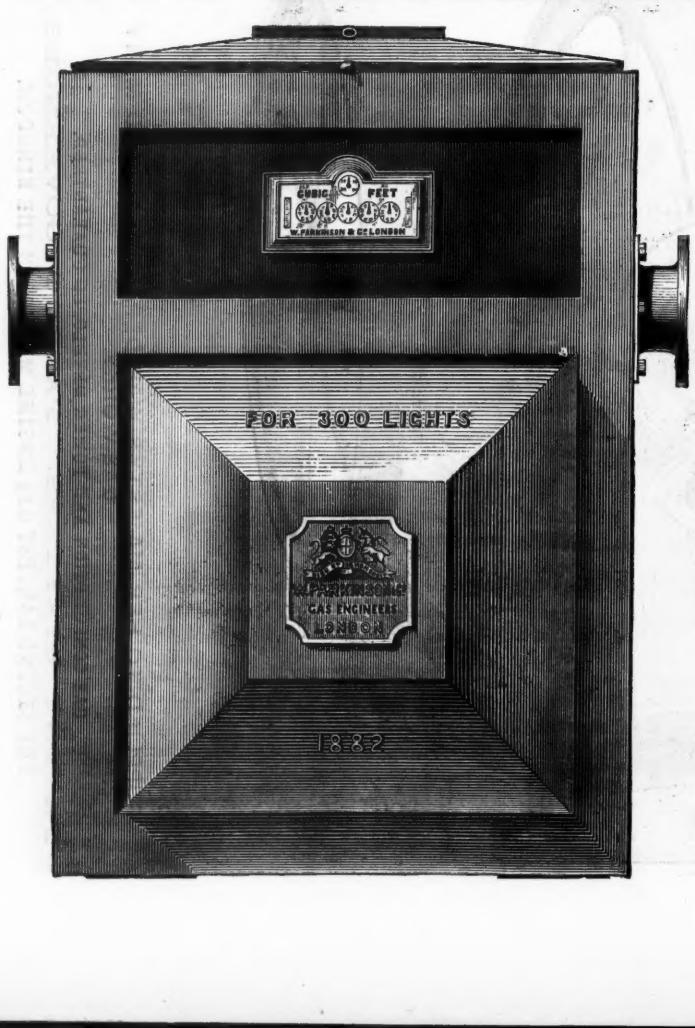

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 14, 1893.

The Labour Topics of the Past Week.

LAST week's parliamentary reports present us with quite a plethora of topics arising out of labour questions that have been brought in some way under the notice of the highest agency for publicity of which this country can boast. To begin with, Mr. Keir Hardie, the workman member for West Ham, moved an amendment to the Queen's Speech, regretting that no reference was made to "the industrial "depression now prevailing, and the widespread misery "owing to large numbers of the working class being unable "to find employment." Mr. Keir Hardie's speech upon his amendment, and those which followed it, showed the utility of a seat in the House of Commons to a demagogue who has gained an outside reputation, the basis of which, if critically investigated, would be found to consist in the ability to utter a deal of unqualified rubbish without being aware of it. Even the member for West Ham, who has talked in his time as much nonsense as any mass-meeting orator now living, not excepting Mr. John Burns, the chosen representative of Battersea, and is admired accordingly by those who do not know better, has learnt, during the short time of his membership of the House, that it is necessary to stiffen an address in the Legislative Chamber with a few more facts than are essential for an open-air oration. Accordingly, in drawing the attention of his brother legislators to the condition of the unemployed, he began by ingeniously manufacturing evidence of the existence of the class in question in sufficient numbers to strike the imagination of honourable members. He cited the returns of Trades Unions to the Board of Trade as showing that some 10 per cent. of the members of these organizations were at a given time out of work. He then jumped from the numbers of trade unionists to the estimated number of industrial workers, which he took at 13,000,000, and assumed that the same percentage of unemployed applied to the whole of them. This, of course, gave him a very large figure. But this did not exhaust the process. Reckoning in the number of persons who might be supposed to be dependent for their means of livelihood upon these unemployed workers, it is easy to swell to 4,000,000 the figure of those implicated in Mr. Keir Hardie's calculations; and what more could be asked for to prove the honourable member's case? We lay stress upon these figures, because they are of value as showing that even a demagogue feels the necessity for adducing something having the appearance of facts when he ventures to address the House of Commons, and also because the hollowness of Mr. Keir Hardie's position is betrayed by the absolute fictitiousness of the data upon which he thus relied in order to make out his case. Following Mr. Keir Hardie came Colonel Howard Vincent—in itself a significant circumstance—who, without seeming to know what he was doing, exposed his newly-found leader's trick. He referred to a certain monthly report of the Labour Correspondent of the Board of Trade as stating that 23 Trades Unions, with 279,361 members, had 28,453 members, or 10·2 per cent., out of employ. This, then, was the datum on which the whole of the elaborate structure of the member for West Ham was erected—a single month's return! But for the corresponding month of the previous year the same Unions returned only 1·5 per cent. of their members as being unemployed. Why should not Mr. Keir Hardie's figures be corrected by reference to the lower return? Nothing could be clearer than the artificiality of the whole case for the so-called unemployed, as got up by professional agitators.

The debate upon Mr. Keir Hardie's amendment was instructive in its way, as showing how hopelessly the self-appointed advocates of what it is unfortunately the custom to call the Cause of Labour are divided among themselves, both as to principles and policy. It also shows that, when politicians pat this or that demagogue on the back, they only have an eye to the votes that may be gained thereby. There is a real Cause of Labour, which good men of all parties and orders in the State wish to serve; but this is a very different thing from the stalking-horse of the same name, employed by time-serving place-hunters in the political world, and professional agitators who had rather talk than work, to help them in making "big bags" for themselves. We give the President of the Board of Trade, the Home Secretary, and others, credit for desiring to serve the true Cause of Labour in introducing their Bills to make provision for conciliation and arbitration in labour disputes, for extending the operation of the Employers' Liability Act, and for creating a Ministry of Labour. In another column will be found an abstract of the last of these Bills, which, in the present aspect of public business, must be regarded as evidence of good intention rather than as a prospective addition to the Statute-book. In all probability, the country will have to wait for some time before the Administration includes a Minister of

Labour; but, meanwhile, the new Labour Department of the Board of Trade will be getting ready for this higher development. If there were any immediate prospect of the Employers' Liability Amendment Bill becoming law, something might be said about its scope and provisions; but, in the circumstances, this would be wasted pains.

The Southern District Meeting—Mr. Carpenter's Address.

THE members of the Southern District Association of Gas Engineers and Managers held their annual meeting on Thursday last, when the President, Mr. C. C. Carpenter, delivered the interesting Inaugural Address that will be found in another column. After the business, the members dined together, as usual. There was a good attendance; and the meeting must be described as in every respect successful, although, for a variety of reasons, many of the members of the profession who are prominently connected with the Association were absent. The report of the Committee testifies to the continued prosperity of the organization; and it may be readily conceded that there is no District Association of Gas Managers in the kingdom that does more for its members or for the industry at large than the Southern. For this high efficiency, great credit must be ascribed to the Honorary Secretary and Treasurer —Mr. J. W. Helps, of Croydon—who has for a long time occupied, in addition to these offices, the even more hazardous and responsible position of "general favourite," both inside and outside the Association. It is pleasant to see that the members know when they are well served; and the testimonial which they took the opportunity last Thursday of presenting to Mr. Helps honours both donors and recipient. In the course of the proceedings, sympathetic reference was made to the loss sustained by the Association in the death, since the previous meeting, of Mr. John Somerville, one of the Past-Presidents, and a regular attendant at these gatherings. The presidential address contained many suggestive observations that come fresh from the author's daily experience as the responsible manager of an important London gas-works; and it is worthy of careful study on this account alone. Mr. Carpenter has, however, given sufficient proof of possessing an analytical and independent mind to invest with additional attractiveness any reasoned statement he may offer respecting the phenomena that present themselves to every gas manufacturer in town or country. The address contains a criticism upon carbonizing methods, upon purification, the enrichment of gas, photometrical standards, and several other good debateable subjects. Mr. Carpenter has ideas of his own in regard to most of the matters he passes in review; and he is not at all reticent in expressing them, irrespective of whose prejudices he may run against. If we may single out for special notice any of the President's statements, it shall be his purification results. To get 80 per cent. of carbonate and 10 per cent. of sulphur in spent lime is surely approaching very near the limits of possibility. Of course, we do not question Mr. Carpenter's analyses; but it would be a good thing if this subject of the duty that can be got out of lime for gas purification were systematically threshed out. There is something also in the suggestion that the working temperature of purifiers should be looked after. Mr. Carpenter made an interesting reference to the use of the spectroscope in the gas industry. Is he able to show us how this instrument might be converted into an aid to the gas manager? If he is not, is there anybody who can be "drawn" for a paper on the subject? Altogether, we must put upon record our very high appreciation of the matter and style of Mr. Carpenter's address; and we do not hesitate to say that this admirable composition will greatly enhance the author's reputation. Any young gas engineer who unites, as Mr. Carpenter does, the philosophic spirit with hard-working practicality, has a good prospect before him, if only his health and strength hold out.

Our Trade Reports.

FROM time to time we receive letters from JOURNAL readers respecting our weekly reports on "Current Sales of Gas "Products." Without exception, these communications are marked "private;" and we are consequently precluded from answering them in the public way that would perhaps do most good. To ourselves they furnish instructive, not to say entertaining reading, because the writers usually answer one another. If we get a letter one week from a buyer of any kind of gas-works residual, complaining that he really cannot make a living at the rates quoted in the JOURNAL, it is never long before another correspondent writes from the other side to upbraid us for making his sales account look so unfavourable. The funny thing is that anybody should conceive the idea that we write these quotations up or down without reference to facts; but that such an idea does prevail in one or two corners of the kingdom we have good reason for suspecting. It will not, therefore, be a work of supererogation if we take this opportunity for stating once more for the benefit of all whom it may concern, that the JOURNAL quotations of the current values of gas-works residuals are based upon actual transactions, and that the observations descriptive of the course of the market are the conclusions of experienced dealers in the commodities above referred to. We cannot be made responsible for any consequences of the publication of these statements to individual buyers or sellers. The grumblers seem to forget that market quotations affect different dealers differently, and that even buyers and sellers may not always agree among themselves as to what is a good or a bad price. We do not pretend to be infallible, whether in recording the fluctuations of the residuals market or in any other department of work; but we do claim that every possible care is exercised to render the JOURNAL worthy in all respects of the confidence of the public generally. If at any time it can be proved to demonstration that no transactions concluded at a given date support the JOURNAL record, we shall know what course to take in the matter; but we flatly decline the responsibility for making the condition of the residuals market agreeable to the wishes of every buyer and seller in the land. No compulsion lies upon anybody to follow the prices given in these columns as representing the value for the time being of the commodities referred to. If stocks and shares, gas coals, tar, or any other article of trade in which our readers are more especially interested, can be procured upon terms differing from those the tenor of which is to be ascertained by consulting our pages, well and good. In the long run, however, we firmly believe that our trade correspondents will be found justified by the facts. Moreover, if anyone who may have reason for dissatisfaction with the ruling prices of commodities, the value of which redounds to the advantage of the gas industry, can hit upon a means of improving the trade in such goods, we will help him to propagate his notions to the farthest range of our circulation and influence. We are wholly without prejudice or preoccupation in regard to the trade in residuals, or any other branch of the gas industry, and its developments. Gas producers ought to get the highest procurable returns for their bye-products; but, on the other hand, tar distillers must live. Our good faith to both parties in the residuals trade has been demonstrated in many ways before now, especially in the matter of discouraging the speculative contract system, whereby one side aimed solely at getting the better of the other. It would doubtless be a good and desirable thing for many people if tar and ammoniacal liquor could be restored to their values of twenty years ago. But there are two sides even to this question; and a good many things have happened since then. There is really nothing for it but to make the best of the conditions of the passing moment.

An Instance of "Progressive" Journalism.

THE Commercial Gas Company are to be commiserated with for having been made the victims of a stupid misrepresentation, which, though quickly corrected, has outlived the correction, and has been circulated afresh by a new weekly newspaper. As we reported last week, there has been a meeting of consumers in the Company's district to protest against the advanced price of gas, which amounts to a total increase of 5d. per 1000 cubic feet upon the minimum of a twelvemonth ago. There is really no valid reason why a Gas Company should be constrained to go on supplying gas for ever at the lowest price to which a concatenation of favourable circumstances may have enabled the Directors to lower it; but, on the other hand, consumers are fully within their right in assembling to publicly complain of what they regard as too high a charge. It so happened, however, that the meeting of Commercial gas consumers, convened for the purpose of protesting against an increase of 5d. in the price of gas, was attended by a reporter who did his work so badly that a prominent evening newspaper interpreted the

report as signifying that the consumers' protest was against an additional fivepenny increase, over and above the two historical increases of 2d. and 3d. per 1000 cubic feet—making a total surcharge of 10d. The mistake was corrected by the Secretary (Mr. H. D. Ellis) as speedily as possible, in the same and other newspapers; but, notwithstanding this, a new journal, published under the title *London*, and declared to be a record of "civic and social progress," repeats the blunder a week later. These blunderings make one suspicious of the self-styled "progressive" press. This journal *London* is published in the interest of the present majority in the London County Council; but the Editor's idea of what constitutes "progress" appears to consist in the fulsome laudation of the handful of would-be municipal magnates who have in all probability been instrumental in floating the venture, and in the adoption of a few Americanisms in spelling and diction. Unhappily, there is nothing "progressive" in truthful reporting, or the use of decent language.

The Late Performances of the Gas Workers' Union.

THE leaders of the Gas Workers and General Labourers' Union appear to be making up for their enforced idleness in regard to the organization of strikes, which are now understood to be unfashionable in the very highest labour circles, by meddling in a variety of matters with which the Union does not seem, at first sight, to have any particular connection. Thus, a short time since some highly patriotic people proposed to equip the London Board Schools with Union Jacks, in order to instil into the minds of the rising generation a proper national feeling. Whether this idea is a good or a bad one, is a question with which we are not concerned; and it might have been thought that the Gas Workers would be equally indifferent. Such is, however, not the case; for a most intemperate letter was sent, in the name of the Union, to the School Board, protesting against the proposal in terms which would hardly have been justified if the writer had been an Italian of the "unredeemed" territory, and the ensign that of Austria. Not content with this freak, the leading officials of the Union made up a deputation last week under the leadership of the Socialist Hyndman—the same who objects to workmen exercising thrift—and went to the Home Office to petition for free breakfasts to be provided out of the rates for destitute School Board children. How little Mr. Hyndman and his companions knew about the cause they appeared to champion was manifested in the course of their interview with the Home Secretary; for they were utterly ignorant of the steps that have been taken for years past, by voluntary agencies, for dealing with the very kind of distress which they attempted to exploit as a discovery of their own. It would have been a bad look-out for the deserving poor of this or any other country if their succour had depended upon the good offices of professional Socialists. However, our point is that, in default of more legitimate enterprises, the wire-pullers of the Gas Workers' Union are manufacturing a cheap reputation for philanthropy, and one or two other qualities, at the expense of the London School Board. This resource must soon be exhausted; and what will they turn to next? Well, the summer is coming, when the mass meetings will engage the services of all the reliable open-air speakers to be had for love or money. From deputation to mass meeting, from "demonstration" to public-house committee-room—it does not sound a very noble progress; and although some of those who make it jump straight, as it were, from the tail-board of a Hyde Park van into the House of Commons, what is the fruit of it all? These be searching questions, not easy to answer without giving offence.

Institution of Civil Engineers.—At the meeting of this Institution last Tuesday, Mr. T. P. Travers, of the Cork Gas-Works, was elected an associate member.

Mr. Jabez Church, M.Inst.C.E., F.G.S., has been elected a Director of the Mitcham and Wimbledon District Gas Company, in place of the late Mr. James Page.

Death of Mr. R. L. Cobb.—The death is announced of Mr. Robert Lake Cobb, of Lincoln's Inn Fields, Rochester, and Higham, Director of the Maidstone Water Company.

Professor Lewes's Cantor Lectures at the Society of Arts.—The series of Cantor Lectures on "The Generation of Light from Coal Gas," delivered by Professor Vivian B. Lewes, F.I.C., F.C.S., at the Society of Arts towards the close of last year, have been reprinted in pamphlet form from the Society's *Journal*, and may be had at their rooms, John Street, Adelphi. The price is 1s.

WATER AND SANITARY AFFAIRS.

THE extended remarks on the Water Supply of the Metropolis, contained in the Inaugural Address delivered at the Westminster Town Hall on the 6th inst., by Mr. W. A. Valon, of Ramsgate, as President of the Society of Engineers, and given in our columns on the following day, furnish a valuable and opportune supplement to the report on "The Flow of the Thames," lately presented to the London County Council by their Chief Engineer, Mr. A. R. Binnie, and commented upon by us last week. The same number of the JOURNAL which referred to the strange arguments of Mr. Binnie, thus gave to our readers the advantage of that clearer and more hopeful light presented by the statements of Mr. Valon. It is to be hoped that the practical significance of these statements will be recognized by at least some of those parties who have been led away with the notion that, unless some grand scheme is at once entered upon for supplying London with water from a new and remote source, a deficiency in the supply may soon be expected. We have, on previous occasions, pointed out what excellent authorities can be cited for a contrary conclusion, and for the confident belief that London has abundant resources for water close at hand. We have now the satisfaction of finding an admirable exponent of the facts in the gentleman who has been placed at the head of the Society of Engineers, and whose entirely independent position gives additional weight to his conclusions. The professional proclivities of an engineer are naturally in the direction of extensive works and magnificent designs, such as stand related to an enormous supply of water drawn from distant mountains or moorlands. But Mr. Valon sees no necessity for any such costly measures in order to give London its proper supply of water for the present and for some time to come. His main reliance is on the underground waters, especially in relation to the chalk. But this, of course, is not London's sole resource. There is the supply from the river; and there is the reasonable probability that water can be stored in the Thames Valley above London by means of reservoirs. Taking rivers, streams, and wells, London has the benefit of something like 200 million gallons per day. Of this enormous quantity it is certain, as Mr. Valon shows, that a considerable quantity is wasted. If waste were checked, and due economy practised, there would be an abundant supply of water not only for the present generation inhabiting London and its suburbs, but for a largely increased population in the future. After all, there is a mass of subterranean water running away unutilized to the east and south-east of London, which could be arrested and turned to good account. We dwelt on this point when the present Royal Commission was first appointed; and we expressed a hope that ample geological evidence would be taken as to the practical value of this resource. We are glad to find that able witnesses have been examined on this part of the subject, though we are inclined to think that actual exploration, by boring or otherwise, would bring such facts to light as would still further prove the justice of the remark made by the Chemical Commission of 1851 in their report, that to waste so excellent a supply of water as that obtainable from the chalk springs, instead of supplying it to the service of the Metropolis, would be "a desecration."

A very extraordinary attempt to arrest the necessary development of the water supply in the districts of the East London and New River Companies has just been made by the Hertfordshire County Council. It is not the first attempt at this kind of obstruction on the part of that authority; but it is none the less remarkable, as practically declaring that Hertfordshire cares nothing whether London has water or not. It having been shown, by evidence laid before the Royal Commission, that the Companies just named were making extensive arrangements with a view to the enlargement of their supply by sinking fresh wells and deepening those already existing, the County Council of Hertfordshire felt moved to send a deputation to the Home Office, asking that the Government would "at "least notify to the Companies its disapproval of the "action contemplated." Sir John Evans having urged this modest request on the Home Secretary, the latter signified that he rather shrank from the proposal, seeing that the Companies might simply tell him that they were merely acting within their strict parliamentary rights. Certainly we think Mr. Asquith would incur serious responsibility

if he were to interpose to prevent the two leading Water Companies of the Metropolis from making due provision for the maintenance of their supply in the future. We regret, and are somewhat surprised, to find the Marquis of Salisbury forming one of the deputation. We presume the Marquis is in agreement with Sir John Evans; but, if so, is his Lordship prepared, in the event of his restoration to power, to do that which the deputation asked the present Government to do? The main plea that was addressed to Mr. Asquith and to Mr. H. H. Fowler (who was also present) was founded on the assumption that these new and enlarged wells would deprive certain parts of Hertfordshire of their due supply of water. Viscount Grimston stated that St. Albans had already been put to additional expense, in order to maintain an adequate water supply. This, however, does not prove much; for it is the common experience of towns. It was added that the watercress industry had been injuriously affected. But whether the watercress beds have been dried up by St. Albans and other towns or by the Metropolis may admit of debate. The Home Secretary and the President of the Local Government Board both signified that, if it could be conclusively shown there was such an abstraction of water for the service of the Metropolis as took away "the natural and necessary "supply" from the towns and villages of Hertfordshire, "then undoubtedly a case would be made out on which "the Local Government Board would feel called upon to "take action." But the London Companies are not likely to exceed their statutory rights; and at the very worst the case of the Hertfordshire towns, or some few of them, can be no more than this: That they will have to deepen old wells and make new ones, after the manner of the East London and New River Companies, only to a much less extent. Even this issue need not be apprehended; and there are facts from which we may conclude that Hertfordshire is making "much ado about nothing"—having water enough and to spare.

Gas for Railway Carriage Lighting.—The adoption of gas for lighting railway carriages is rapidly extending in the United States. We learn that two new plants on the Pintsch system were put in operation last month—one at Kansas City, and the other at Toledo.

Awards of the Royal Horticultural Society for Heating Appliances.—The Royal Horticultural Society of England will hold a Grand Flower Show in the Agricultural Hall, London, on Aug. 29 to Sept. 1 next, when it is intended to make special awards for heating apparatus and appliances that are practically tested in the building.

The Estate of the Late Mr. S. H. Thompson.—The will of Mr. Samuel Henry Thompson, late of Thingwall Hall, Broad Green, Lancashire, who was one of the Directors of the Liverpool United Gas Company, has just been proved. Mr. Thompson died on the 17th of December last, leaving personalty valued at £1,133,792.

Deaths of Electricians.—The death is announced of Mr. J. E. H. Gordon, the well-known electrical engineer, whose business was recently converted into a joint-stock company, under the title of Messrs. J. E. H. Gordon, Fell, and Co., Limited. Mr. Gordon was killed by the fall of his horse. Another electrician whose name has at various times appeared in our columns in connection with electric lighting affairs in Brussels—M. Van Rysselberghe—has been removed by death at the age of 46.

Automatic Machinery in Gas and Other Works.—As the result of an examination by the Gas Committee of the Huddersfield Corporation and the Gas Engineer (Mr. W. R. Herring) of the various kinds of automatic coal and coke handling systems at work in Lancashire, the Midlands, and the London district, they have placed with the New Conveyor Company, Limited, the order for the whole of the automatic appliances for a new retort-house with inclined retorts. It includes two steam-engines, two coal-breakers, and an extensive system of duplicate elevators and conveyors. The arrangement, which was carefully considered and discussed by Mr. Herring and Mr. Gilbert Little (the Managing-Director of the Company), is claimed to be one of the most thoroughly automatic that has yet been set out. An installation of Mr. Little's latest design of steel chain conveyors and elevators is now in hand for the tar and liquor works of The Gaslight and Coke Company, at Beckton. The conveyors are of a new design, with cast-iron troughs having the joints all planed to ensure that the run will be parallel, and perfectly true from end to end. We learn that, in order to enable gas engineers to inspect the different kinds of conveyors and elevators during the summer months, Mr. Little is now equipping a gas-works in Lancashire with one of each of his different designs. This will allow the earliest and latest forms of conveyors and elevators to be inspected working side by side, and afford facilities for judging as to their respective merits and demerits.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 284.)

In reviewing the course of affairs last week on the Stock Exchange, it would almost suffice to reiterate what we said of its predecessor. There is really no change of any sort to be detected. The revival of speculation seems to be as far distant as ever; but the investment of money in the gilt-edged securities proceeds without any abatement. The prices to which the latter are being forced up by the incessant demand have reached points of altitude hitherto unattained. Last Thursday, Goschens were done at 99⅜. But everybody cannot buy Consols; and there is not enough of first-class securities to go round. Accordingly, some of the less choice and less expensive articles are coming to the front; for the abundant money, which cannot find other employment, must be invested in something. Business on the whole has been quiet, especially after the settlement had been adjusted. The Gas Market, like the rest, has been below the average of activity; but its general firmness is unabated. All the Metropolitan undertakings maintain their strength. Gaslight "A" opened steady, and showed a disposition to improve as time went on; marking on Friday 223 *ex div.*, with a rise of 1 in the quotation. There was less doing in the debenture and preference issues, but all were very firm; while some of them show a good advance in their *ex div.* quotations. South Metropolitans were less active than in the preceding week; but all transactions effected in them were done at excellent figures, and the "B" has advanced in price. Commercials were quiet; stock appearing to be scarce, or it would have met with buyers readily. The Suburban and Provincial Companies were firm and inactive; the only change being a rise of 3 in Brentford new. The Directors will recommend dividends at the reduced rates of 11½ and 8½ per cent., as if the increase in the price of their gas had been made as from the 1st of July, instead of the 1st of October last. According to precedent, they might have averaged the rate over the half year. However, we have nothing to say against the commendable prudence of contentment with a moderate rate of dividend; many companies have sinned in the opposite direction. Among the Continentals, European and Imperial have been pretty active and very firm—Union remaining quiet. None of the rest offer any feature for remark, except Buenos Ayres, whose debentures are 1 higher. The Water Companies have been fairly active, considering the general quietude; and a few have advanced in value, though Southwark and Vauxhall has receded.

The daily operations were: Gas opened firm at the last prices, and continued strong, though rather inactive. Brentford new rose 3. In Water, Lambeth 7½ per cent. rose 1½; and ditto debenture, 2. Tuesday brought an increase of activity; but everything dealt in fetched good prices. South Metropolitan "B" advanced 1. Southwark and Vauxhall Water fell 2. Transactions in Gas fell off considerably on Wednesday; and nothing moved either way. Thursday was just as stagnant; but prices sat very tight. Buenos Ayres debentures gained 1. Friday was a little more brisk, especially for business in the heavier issues. Lambeth 10 per cents. rose 2. Saturday was much the same as usual; and all quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Result of the Electrical Exhibition at the Crystal Palace—Colonel Makins, Mr. W. H. Preece, and the Cost of Lighting the City of London—Proposed Electric Lighting for Tunbridge Wells—Electrical Traction.

The remarks of the Chairman of the Crystal Palace Company at the recent half-yearly meeting of the shareholders cannot be pleasant reading for electricians. The past year was not a good one for the Company; and part of the trouble was caused by the unfortunate Electrical Exhibition, which was "an enormous failure," so far as the financial results were concerned. People stayed away from the Palace, to the tune of £8000 of diminished gate-money; season-ticket holders paid less by £1000; and the Exhibition so blocked up the space of the Palace that other attractions could not be accommodated. Very much the same story was told at the preceding meeting of the Company; but this time the narrative was repeated with emphasis. Of course, it is asserted that the Electrical Exhibition was as great a technical or scientific triumph as it was a commercial failure; but it is impossible to accept this view of the affair. The exhibition was a financial speculation pure and simple. No scientific or technical problems were either illustrated or solved by it. There was nothing like the long-distance transmission of power by electricity that distinguished the Frankfort undertaking of the same class. It was simply a bid by electricians for custom; and the long and short of the matter is that they managed so badly as to drive people away from the Palace instead of attracting them to it. The public are to be congratulated upon this demonstration that buzzing dynamos do not constitute an attraction to sight-seers. Of late years the electric light station has been too much in evidence at exhibitions; but, after the Crystal Palace *fiasco*, it may be hoped that electric lighting machinery will be kept in its place, as a possibly useful, but certainly not ornamental, adjunct to a pleasure resort.

The outspoken remarks of Colonel Makins, at the recent

meeting of The Gaslight and Coke Company, respecting the "sublimated drivel" of parts of Mr. W. H. Preece's address to the Institution of Electrical Engineers, have not been allowed to pass unnoticed. The opportunity was promptly seized by Mr. David Cook, the Engineer and Manager of the City of London Electric Lighting Company, for pegging an advertisement of this struggling concern into the daily newspapers. Of course, this ingenious gentleman misquoted and misrepresented Colonel Makins, who spoke of the defunct electrical speculations of the year 1882, and only applied the depreciatory language in question to Mr. Preece's nonsense about electric lamps being the poor man's light, and his vapouring about getting electricity at a cost equivalent to gas at 2d. per 1000 cubic feet. In replying to his assailant, Colonel Makins gave the City of London Electric Lighting Company such a "hoist" with their "engineer's own petard," that the latter is probably by this time sorry he meddled in the matter. He accounted for the acidity of Colonel Makins's utterances by stating as a fact that whereas the rental of The Gaslight and Coke Company for the City of London has amounted to £250,000 per annum, the Electric Lighting Company which is "now supplying electricity over less than a tenth of the City area, has connections and applications representing a revenue of about £61,000 per annum." Colonel Makins politely thanks Mr. Cook for thus informing the public that, while the gas bill for the City is £250,000 a year, "more than £610,000 a year would be the cost of replacing gas by electric light." This is a way of looking at the alleged fact which, it may be safely said, did not occur to Mr. Cook.

While referring to Mr. W. H. Preece, as criticized by Colonel Makins, it may be interesting to cite the example of Tunbridge Wells as illustrating Colonel Makins's remark that, the investing public being shy of electric lighting schemes, municipalities and vestries are being cultivated by electricians. Tunbridge Wells has an Electric Lighting Order, which cost the town £431; and the Town Council have not known what to do with it. In their dilemma, they called in Mr. Preece, who has, of course, strongly advised them to carry out the Order on their own account. And here we might give an instructive lesson in the manners and customs of estimating electricians, if it were worth while. It must suffice to say, however, that Mr. Preece starts with the assertion that gas at 3s. 3d. per 1000 cubic feet is equivalent to electricity at 6½d. per unit. Assuming Tunbridge Wells to require 13,000 incandescent lamps, charged for at the rate of 7d. per unit, Mr. Preece declares that the total cost of the supply will not exceed 4d. per unit, and "hence the working expenses will be 57 per cent. of the receipts." It will naturally be easy for the Borough Accountant of Tunbridge Wells to find corroboration for these figures in the published accounts of electrical supply establishments in action elsewhere. The gist of Mr. Preece's recommendations is that the Town Council should spend £13,000 upon a central station, just by way of "making a fair start." It will indeed be a start, for the Corporation; but if the ratepayers are wise they will require information as to what the finish is likely to be, before they trust themselves to Mr. Preece or any other electrician.

The opening of the Liverpool Overhead Railway by the Marquis of Salisbury nearly coincided with the half-yearly ordinary general meeting of the shareholders of the City and South London Railway Company. Both undertakings are representative of the serious form that electrical traction has to take in order to find an accepted place in the transit arrangements of English towns. It is often stated that there is a great deal more electrical traction work done in America than there is in this country; but the difference in the conditions must not be overlooked. In the United States, a "trolley-wire" and a portable engine and dynamo constitute an electrical tramway. But outside the Black Country or the Potteries, no such appliance is likely to find favour with a British municipality. The Mayor of Coventry expressed the general feeling in this regard when he declared *à propos* of the suggested introduction of a trolley-wire tramway system into the town, that the Corporation ought never to countenance anything of the sort. In all probability the Liverpool Overhead Railway will answer its purpose sufficiently well; and it is gratifying to hear improved accounts of the City and South London undertaking. The transit problems of our large cities are sufficiently grave to ensure a welcome for all well-considered plans for facilitating the movement of the population; and electrical traction will be judged in this connection on its merits, like any other system of locomotion.

"'The Electrician' Electrical Trades Directory and Handbook for 1893."—We have received a copy of the above Directory, which has now reached its eleventh year of publication. It affords a striking illustration of the rapid growth of the various industries connected with electrical science; for whereas the first volume, issued in 1882, contained only 100 pages, the one just published has more than ten times this number. The Handbook Section (400 pp.) consists of a mass of statistical information conveniently arranged for ready reference, and comprising many new features of importance. The Biographical Section is preceded by a plate portrait of Mr. W. H. Preece, President of the Institution of Electrical Engineers. Every effort has been made to bring the Directory quite up to date.

COOKING-GAS AT COPENHAGEN.

An interesting experiment is about to be tried by the Danish Gas Company, according to a scheme conceived some time ago by their enterprising Engineer, Mr. F. D. Marshall, who procured the consent of the Directors to his project in the course of last summer, and has been pushing on the works with such energy that they are expected to be ready for the coming summer season. In order to understand the justification for Mr. Marshall's present scheme, it is necessary to recall the fact that, of all European countries, Denmark appears to have presented the most favourable conditions for the introduction of gas cooking apparatus. This discovery was made at the town of Nakskov many years since; and now in other Danish towns the day consumption of gas in summer is the principal source of the gas company's revenue. The reason for this extraordinary phenomenon has never been fully explained. It has, doubtless, something to do with the habits of the people, but more with their circumstances. Owing to the working of some undefined economic laws, the people of Denmark appear to enjoy a high average of comfort. If rich men are scarce, paupers are equally so; and the truly remarkable result follows that the potentiality of gas consumption is greater in a Danish town than anywhere else. In other words, an unusually high proportion of the population are eligible customers for a gas company, though, owing to the lack of large factories and commercial establishments, the rate of consumption per head may not be high.

The Danish Gas Company have been in a position to take careful stock of the manners and customs of the gas-consuming portion of the Danish townspeople. They have, indeed, been compelled, by force of circumstances, to do so; for their situation in Copenhagen has required them to conduct their business upon strict commercial principles. With a municipal gas undertaking at their elbow, the Company have been upon their mettle; and their record shows how much can be done by a Gas Company working under able management with a free hand, like any other traders. It does not need much perspicacity to see that, in the circumstances, the Municipality of Copenhagen would have been only too pleased if their undertaking had been able to crowd out the English Company; but it is a striking comment upon municipal gas management that not only has this effect utterly and entirely failed to come about, but the Company have actually hemmed in their rivals, and have secured all the districts where the city is extending itself. It is not that the municipal gas undertaking is badly managed, from the technical point of view. Indeed, the Engineer and Manager is known for a capable and painstaking man; but the fact it that, where a trade has to be carried on under anything like competitive conditions, a local authority has no chance against traders. If the Danish Gas Company had been bound in bonds of red tape, like most of the British statutory companies, they would have fared badly enough. As it happens, while Mr. Marshall has not had the questionable advantage of statutory protection, enabling him to square everything by fixing his selling price to suit his own convenience, neither has he been prevented from carrying on his business in the most aggressive style. What he has done in the way of hiring out high-power lamps, to say nothing of stoves, and how he has hunted up trade and appropriated promising districts, would amaze many a jog-trot British gas manager to hear.

The lesson of Nakskov was not likely to be lost upon a Company so very wide-awake to everything likely to make for their advancement. In New Copenhagen and its outskirts, Mr. Marshall perceived the field for repeating the example of Nakskov, with advantages. Readers of that interesting book of unconventional travel, the "Falcon in the Baltic," must have been struck with the author's picture of the green shores of this almost tideless sea, studded with comfortable houses whose gardens run down to the calm waters. It is like the banks of the Thames for homeliness; and the remarkably English aspect of everything is explained by the historical fact that it really was from here or hereabouts that the English people originally came. For thirty miles out of Copenhagen towards the north, the Baltic is thus lined with the summer residences of well-to-do Copenhagen citizens, who migrate from the town as soon as the short, but hot northern summer fairly opens, and live by the sea-side until the autumn. Wiser, or more home-loving, than many people, these Danes prefer to spend their holiday in a house of their own; and since they naturally like to spare themselves as much of the trouble of housekeeping as possible, a gas-stove is the very thing for their needs.

This, then, is Mr. Marshall's new scheme. He has secured the right to lay gas-mains along the trunk road serving this Baltic pleasure-ground, and has nearly completed the gas-works. He expects, at any rate, to begin to supply as soon as the consumers are ready; and, seeing that his plans were only passed by the Board last summer, he cannot be accused of losing time. This establishment is to make cooking-gas only, and, like the houses which it will serve, it will be shut up during the winter. As everybody in the district of supply will go to bed by dusk, or soon after, the demand for gas for lighting purposes is expected to be small. Illuminating power being a secondary consideration, the system of working will be to get the utmost yield from the coal consistent with fair play. A portion of the coke will be drawn directly into water-gas producers, and the "blue gas"—uncarburetted water gas—will be mixed with coal gas.

The resultant mixture will be a gas of about 12-candle power; and for lighting best rooms consumers are to be encouraged to employ Welsbach burners. Free use of labour-saving machinery is to be the rule of the works; it being desired to sell the gas as cheaply as possible. It will be instructive to see at what cost gas of this description can be made in a brand-new works, provided with every modern accessory for cheaply carbonizing coal, and administered upon purely commercial lines.

Another curious thing may be mentioned in connection with these novel works. Everything has been done by the Company on their own account, without the intermediary of any contractors, except for buildings and bricklayers' work. Special care has been taken with the mains, which are laid at a good depth, and subdivided into sections. All the services are inserted as the work proceeds; and every day's work is severely tested—the sections when completed being again tested under 24 inches of water pressure. If ever a gas-distributing network was tight, this ought to be; and Mr. Marshall expects to floor the bogey of "unaccounted-for gas" when the supply is turned on.

Altogether, it must be admitted that this new departure of the Danish Gas Company is of an exceedingly interesting character, and its results will be most instructive. We can only describe here the general features of Mr. Marshall's scheme; but it is to be hoped that the Institution of Gas Engineers will keep an eye upon the experiment, and obtain from the author an early statement of his proceedings and the results. It is the only speculation of the kind in any part of the world. Indeed, there are not many places where any such experiment could be tried, upon so large a scale, with the remotest hope of commercial success. As it is, there will be much shaking of heads in sundry places over the idea of a gas-making establishment which is to be shut up for half a year; but this is only what happens in the case of most British gas-works which, for all the profit they earn during the summer, might as well be let down. Meanwhile, all the permanent staff have to be kept on, and more gas made than is wanted, just to provide for the chance of a dark evening.

There has been so much talk in all parts of the world about artificial fuel gas and its prospects, that this experiment in the suburbs of Copenhagen will be watched with the keenest scrutiny for all its development. We have no hesitation in stating our belief that the experiment is eminently worth making, and that it will turn out a profitable one for the Company. The local considerations will, however, weigh so heavily in the result, that it will be difficult to repeat the precedent elsewhere, without exercising much circumspection. We can also say, without fear of contradiction, that, if a fuel gas is to be successfully made for sale anywhere, the mixture preferred by Mr. Marshall offers the best prospects of satisfying both manufacturers and consumers. There is nothing like coal gas, of course, for strength, safety, and general applicability; but the advantage of mixing with it a proportion of water gas made from surplus coke may be considerable. Exactly what proportion to use, is a question to which Mr. Marshall has doubtless given his attention, having regard to the local value of coke as a solid fuel. There will be no producer gas in the mixture, for it is the crudest waste to distribute nitrogen; but the practicability of using producer gas will be something to study for the sake of economy. There should also be some interesting points about the purification and the recovery of the residual products.

At what price it is proposed to sell this mixture, or how it will compare with the ordinary Copenhagen supply, we cannot say. We do not profess to be able to furnish many details regarding an experiment in gas supply which is yet "in the air," but only to give, in general terms, an illustration of the way in which gas engineering enterprise may be directed to suit special requirements, when the Company concerned is not in statutory leading-strings.

Errata.—In the article on "Coal Gas: Its Manufacture, Distribution, and Consumption," which appeared in the JOURNAL for the 17th ult., the first five lines in the fourth paragraph on p. 96 should read as follows: "The theoretical amount of oxygen required is 0·1 per cent. for every 100 grains of sulphuretted hydrogen in 100 cubic feet of crude gas. Thus, a gas containing (say) 400 grains of sulphuretted hydrogen per 100 cubic feet would require the admission of 0·4 per cent. of oxygen, or 2 per cent. of air."

Map of the River Basins of England and Wales.—We have received from Mr. J. E. Cornish, of No. 16, St. Ann's Square, Manchester, a well-executed map of river basins in county groups. It has been prepared by Mr. C. E. De Rance, Assoc.M.Inst.C.E., F.G.S., the Secretary of the Underground Waters Committee of the British Association, for Mr. J. T. Brunner, M.P., for presentation to the County Councils of England and Wales. The map defines the natural jurisdiction of Joint Committees of County Councils for the prevention of the pollution of rivers, and other matters requiring united control. At the foot are some remarks explanatory of the colouring and shading adopted; the watersheds, or natural boundaries between rivers flowing in different directions, and the groups of river basins approximating to County Council districts' watersheds being distinctively marked. The scale of the map is about 16 miles to an inch.

NOTES.

Desulphurizing Coke.

The desulphurization of coke is still an unsolved problem, notwithstanding the efforts of many inventors of processes for coking coal and treating the product with this object. Curiously enough, the same idea—that of withdrawing the gaseous products of carbonization from the bottom, instead of from the top of the charge, as is usual in both coke-ovens and gas-retorts—has recently been suggested for the two different objects of getting rid of both sulphurous gases and carbonic acid gas. Sir G. Elliott and Mr. J. MacGowan, jun., have patented certain improvements in or relating to the manufacture of coke, among which is included the construction of ovens having at their lower corner a number of tiles arranged obliquely at slight intervals apart, so that the heavy sulphurous fumes may have ready access to a pipe provided for their removal at or below the level of the floor. This pipe is connected with a suitable form of exhaust fan or suction apparatus, by which the sulphurous gases which would not be removed from the upper flue can be drawn off, preferably towards the latter end of the carbonizing process. It is claimed that in this way the percentage of sulphur in the coke is reduced, and its commercial value increased in consequence. Mr. E. A. Ebb suggests the same means for removing the carbonic acid formed in ordinary furnaces, instead of permitting it to be drawn up through the fuel; his idea being that, as this gas is a non-supporter of combustion, its presence tends to check the process of combustion.

Roasting an Ox by Gas.

Herr E. Merz sends to the *Journal für Gasbeleuchtung* a highly picturesque account of the roasting of a whole ox by gas on the occasion of some festivities at Hanau last September. The roasting chamber was made of sheet iron, 3·2 metres long and 2·4 metres wide, and of convenient height to take the ox on a spit, which was turned from outside by suitable gearing. The carcass was strongly trussed by screwed skewers and iron straps, so as to hold it together. A perforated pipe ran above and parallel to the spit, terminating outside in a funnel at each end, for the purpose of basting the meat; and there was a suitable dripping pan underneath it. The roasting apparatus was separate from the casing, and consisted of a waggon-shaped framework of gas-piping. The two semi-circular ends of this framework were made of 2-inch pipe, connected by 16 longitudinal pipes ¾ inch diameter, eight on each side; the two lowest being set inwards, so as to throw some heat underneath the carcass. These pipes carried 448 burners in all; and the gas, measured by a 100-light meter, was connected to both ends of the framework, so as to ensure regularity of burning. The whole affair was got up with an eye to effect; the oven being enclosed in a shed fitted up with carving and serving benches, and surmounted by a coloured lantern with the words "Cooking by Gas." The ox weighed 650 lbs. as trimmed for roasting. It was killed six days before being cooked, flavoured with 3 lbs. of pepper and 15 lbs. of salt, the back covered with parchment paper, and roasted from 9 in the morning till 3.30 in the afternoon, with a consumption of 300 cubic feet of gas. The cookery seems to have been a great success; the meat being described as "extraordinarily savoury, tender, and juicy." In an hour and a half from the time the carving commenced, nothing but the skeleton remained.

The Temperature of the Electric Arc.

M. Violle has been making some experiments with a view to determining the temperature of the electric arc, formed under various conditions, from 10 ampères and 50 volts to 400 ampères and 85 volts—that is, from 0·7 to 46 horse power. The experiments were made with an Edison continuous-current dynamo. The important observation was made that the brilliancy of the positive crater is exactly the same for arcs differing so widely in power. It follows from this that the temperature of the positive carbon, as well as that of the particles of carbon contained in the arc itself, is constant, whatever may be the consumption of energy. This is the temperature of the volatilization of carbon. The quantity of heat evolved per gramme of carbon, or—which amounts to the same thing—the quantity of heat necessary to bring a gramme of carbon from 0° C. up to the temperature of volatilization is 1600 calories (gramme × degree Centigrade). Since, according to Weber and Dewar, about 300 calories are required for heating a gramme of carbon from 0° to 1000° C., there remain 1300 calories attributable to the heating of the carbon from this temperature to the point of volatilization. If the specific heat of the carbon remains constant at 0·52, these 1300 calories will represent 2500° C. of temperature. Hence the temperature sought is 3500° C. Upon this determination of the heat of the carbon arc being submitted to the Académie des Sciences, M. Berthelot remarked that, in the course of some experiments which he had made with M. Vieille, he had established the existence of effective temperature in the electric arc of from 4000° to 4500° C. Apart from this, however, certain tests by M. Vieille showed the probable existence towards 3200° C. of a considerable tension of carbon vapour. Furthermore, it is to be remarked, in regard to the phenomenon of the volatilization of carbon, that this latter body, as we know it, is a polymer. Consequently, a double phenomenon occurs when it is volatilized, and the energy absorbed in polymerization is restored and the monomolecular element is vaporized.

COMMUNICATED ARTICLES.

THE USE OF AIR FOR THE PURIFICATION OF GAS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

Judging from some inquiries I have recently received, the subject of the use of a small percentage of air in connection with oxide or lime purifiers, as an aid to the economical and efficient purification of gas, is again attracting some attention. Probably the cause of this is the fair and temperate consideration of the whole question that is included in the series of articles for gas students which are now appearing in these columns (*ante*, p. 96), in which the writer accepts the fact that "in many gas-works air *is* passed with the gas through the various apparatus, without the same depreciation of illuminating power as attends the mere mechanical admixture of air and gas," and farther on remarks that "the resultant depreciation may not be felt." This, I believe, covers all that those engineers who have found that the air process can be advantageously adopted in practice, have claimed for that system. No one has denied or impugned the accuracy of experiments made by Dr. Schilling and others, which show that the effect of mixing air or nitrogen with gas is to reduce the illuminating power to the extent of 7 per cent.—more than one candle—for each unit per cent. of diluent added. In saying that air can be used in connection with purification with or without certain results, we do not touch upon what might happen if the mixture was made in the absence of purifying apparatus. Just, for example, as one might praise the ability of Mr. Gladstone as a financier or a Greek scholar, without being considered to accept, by so doing, the views of that eminent statesman on the Irish Question. And, further, it is quite sufficient to state the observed fact, without necessarily furnishing an explanation that fits in with the above-mentioned experiments, or with any others that do not at first sight agree with it.

It is only reasonable to expect that the results of using air should vary at different gas-works, just as all other results connected with purification vary. At no two works are the conditions the same. Several kinds of coals are used; different methods of carbonizing, condensing, and scrubbing are employed. The proportionate area of the apparatus concerned to the quantity of gas dealt with, may vary widely; and it is the same as regards the proportion of impurity to be removed. Many other factors that go to affect the ultimate result might be mentioned. Therefore it follows as a natural thing that the results achieved at one works are in no sense a proof that different results are not, and cannot be, obtained at another. Yet an attempt has been made to cast ridicule on the air process, on the ground that the results do not agree either with those recorded some years ago, or with those obtained at other works. If this form of argument is to be followed, none of our supposed improvements are worthy of confidence. Regenerator furnaces, inclined retorts, mechanical stoking, all display great diversity in results, comparing one works with another; and in each case the statistics of the present time show a considerable advance as compared with those recorded when the matter was in a less advanced state. No one thinks of condemning the principles underlying these innovations because of variations in results, or because one or more of the reports may possibly show signs of haste or inaccuracy in their preparation. Why, then, should discredit be attached, on these grounds, either to the process itself, or to the honesty or ability of the numerous gas engineers who use it.

Most of those who make a fair, careful, and extended trial of this process adopt it permanently. The number who reject it are so small as to form the exception which proves the rule. The chief cause of the prejudice that seems to exist against it is an obstinate determination to refuse to recognize the existence of compensating causes, and in accepting the experiments of Dr. Schilling and others upon pure gas as a proof of the ultimate result obtained when air is admitted at any stage of the purifying apparatus. There is nothing at all unreasonable in supposing that the air may assist in reducing the depreciation in illuminating power and loss of hydrocarbons that is known to obtain, to a greater or less extent, in every purifying-box. "Out of two evils choose the less;" and whether the less is the retention of a small portion of nitrogen in the gas, as compared with the precipitation, and consequent return to the tar-well, of a part of the valuable light-yielding hydrocarbons, is a matter to be decided, not by dogmatic assertion, or even by reading of the results obtained at other places, but by careful individual experiment in each case.

But here another difficulty comes in. If the photometer shows that air purification may be resorted to without prejudice to the quality of the gas, we are met by the assertion: "So much the worse for the photometer." So it is necessary to fall back on general facts and ask: "Is there any case known where the adoption of the air system has led to dissatisfaction among the consumers?" No doubt, from sentimental considerations, the inhabitants of a district would at once fancy there was something wrong if they were told that such a system was in use. But, as a matter of fact, there is no evidence whatever to show that gas treated by the air process is less acceptable to the consumers than any other. It neither diminishes the value they receive from the gas nor raises their accounts. There is no sign whatever of a greater degree of dissatisfaction than is the general experience. With this point in view, it must be remembered that any economy that can be introduced in working expenses goes for the ultimate benefit of consumers. Therefore, so far from being unjust, a form of robbery, &c., it is really a benefit to all concerned.

No doubt the photometer may be overdone, and made too much of. If a description of gas is supplied that gives general dissatisfaction, it is of no use to get behind the legal test, and say that it conforms to the parliamentary requirements. Consumers may possibly be silenced by such a plea, but they will not be satisfied; and it should be the object of every gas-works manager to satisfy his customers. But while there may be some ground for saying that the photometer does not prove everything, it is rather bold to say that it proves nothing. Surely some degree of value is to be attached to its indications, or it would never have attained the position of a standard testing apparatus. A gas that shows well in the photometer-room is more likely to give satisfaction than one that does not. Beyond this, there is the question of whether consumers find the gas suited to their wants. For information on this point, we must go to the complaint-book, which should be a recognized feature in every gas-works. It should contain a concise record of all complaints, whether real or imaginary, together with the remedy adopted, if one is practicable. The latter class of complaints are by no means to be overlooked, however ridiculous they may appear. They are accepted as reasonable and real by one person at least—the consumer who brings them—and often by many others in addition. At any rate, they indicate the current of public opinion, or public prejudice, which is much the same thing. They are straws which indicate the way the wind is blowing. I have kept such a record for many years, and refer to this fact in order to show that, in saying that the proper use of the air process need not injure either the gas or the consumers, there is no getting behind the photometer, but speaking from actual knowledge of the whole circumstances.

On consulting a friend at the time the introduction of this process was under consideration, I was warned that difficulty would arise on account of stratification, which would lead to complaints from consumers living at the extremities of blind mains, or in the lower levels. There is no reason why 1 per cent. of nitrogen should be more likely to stratify than any other permanent gaseous constituent. Still this point has received careful consideration; and the complaint-book shows that there is not the slightest foundation for it in fact, so long as the air process is properly applied—that is to say, where a larger quantity than is sufficient to combine with the sulphuretted hydrogen is not used. I cannot speak as to the effects produced when a real *excess* of air is admitted, not having had any experience on this point, and regarding it as an abuse rather than a use of the air system.

In joining in a discussion on this subject at the 1889 meeting of The Gas Institute, I mentioned a fact that had been observed in the practical working of this system, which might help to account for the absence of such depreciation in the quality of the gas as might be expected from results obtained by diluting pure gas with air. It was the increased temperature in the purifiers. The writer of the articles already referred to has also observed the same thing. All who have had much experience with purification in cold weather will agree that this is an undoubted advantage, and for many reasons. Other matters might also be suggested. For example, it is necessary to assume, when one persists in treating air admitted at any part of the apparatus prior to the purifiers, with air as used in Dr. Schilling's experiments, that the nitrogen passes freely through the purifiers without being acted upon. I am under the impression that some of it is absorbed, and goes to form cyanogen, or possibly other nitrogen compounds. The oxide employed during the four years' working of this process appears to be richer in that class of substances than was formerly the case; but, unfortunately, it is only with the last few years that I have begun to examine oxides for cyanogen or Prussian blue, and therefore have no data for comparison. The absence of any accurate method for determining nitrogen in coal gas renders it impracticable to investigate this point further; so I do not place much importance upon it, but merely instance it as an example of the difference between air admitted before the purifiers, and that merely mixed with pure gas. But whether or not this is a correct explanation, there is no getting away from the observed fact, which is now proved to be the case in all parts of the country, that a small percentage of air may safely be used without injury to the rights of the consumers, and with advantageous results.

As with any other quantitative purifying process, by which I mean any process depending upon the regular addition to or admixture with the gas, of proportionate quantities of gaseous or liquid reagents, this system must be worked systematically and carefully, if it is to be a genuine success. When this is done, it offers several practical advantages. The material does not fail suddenly, but very gradually; so that, even in the depth of winter, a few days' notice of the necessity to change a purifier may be confidently looked for. The oxide, when thrown out, revivifies quite as rapidly as it does when no air is used. As the system admits of a much longer period of rest, it is not necessary to turn the oxide repeatedly with the shovels, in order to hasten its revivification. A considerable saving of that

costly and unreliable article, labour, is thus represented. Back-pressure and caking of the material are caused by *excess* of air, if they occur at all; and with proper working they are entirely avoided. Sometimes, after the material has increased largely in sulphur, by passing a comparatively large quantity of gas, it swells to such an extent as to increase the back-pressure; but it never does this so suddenly as to cause a stoppage or loss of gas. As with the failure to absorb sulphuretted hydrogen, this takes place so gradually that it is sure to be observed at the exhauster outlet before any harm can be done. Probably, on account of the thorough revivification secured by a longer period of rest, there is none of that weak and unreliable action sometimes experienced with oxide that has already absorbed about 40 per cent. of sulphur; and it can easily be charged up to 60 per cent. or more. As to the question of nuisance, which is of importance where the gas-works are situated in a crowded neighbourhood, there is not only the reduction caused by less frequent opening of the boxes, but there is no necessity for hurried changes at all hours of the day or night, so that arrangements can be made for dealing with the foul material in the most effective way.

I have never attached much importance to the "carburetting" of the air, either by admitting it at the hydraulic main, or passing it through special apparatus for bringing it in contact with hot tar. If the condensing arrangements are as they should be, and the heavy tars are removed at a proper temperature, but little benefit can be looked for, as substances that have once separated from the gas cannot be expected to remain permanently, if returned to it. In my case, the inlet of the exhauster is the only locality where a sufficient degree of exhaust exists to draw in the required proportion through the meter and a small hydraulic seal (which acts as a safeguard in the case of back-pressure due to the accidental slowing or stopping of the exhauster). So this point was selected, as avoiding the necessity for a small exhauster or other arrangement for injecting the air. Nitrogen would act as a carrier of hydrocarbon vapours, in the same way as hydrogen, carbonic oxide, or any other permanent gas; but the quantity concerned is too small to render this of any moment.

Patents in 1892.—Since 1883 there has been continued progress in invention; and the record of applications for patents in the past year shows a distinct advance on any previous twelve months. The number was 24,166; being 1278 more than in 1891. The chief event of the past year in connection with patent work was the reduction made by the Board of Trade in the renewal fees. This came into operation on Oct. 1 last; and its effect has been to reduce the total cost of a patent from £154 to £99—a saving of about 36 per cent. on the fees previously existing.

Cyanogen Compounds in Spent Oxide.—In a recent number of the *Journal für Gasbeleuchtung*, Herr Burschell discussed the formation of ferrocyanides and sulphocyanides in oxide purifiers, and the influence of ammonia on revivification. He concludes, from Leybold's researches, that the ammonium cyanide in the gas acts on the iron sulphide, and that, when the oxide is exposed for revivification, the iron cyanide is converted to Prussian blue. The formation of sulphocyanide he attributes to the presence of ammonia, which induces reaction between sulphuretted hydrogen and ammonium cyanide. Its formation is also possible during the revivifying process; the heat thereby generated being sufficient to cause the ammonia retained in the moist oxide to act on the iron cyanide or the Prussian blue. This secondary formation of sulphocyanide can, however, be avoided by freely damping the oxide on removing it from the purifier, and preventing too great a rise of temperature during revivification. To get rid of the objectionable ammonia vapours as quickly as possible, and to check the heating of the mass, it is recommended that oxide for revivification should be spread in as thin a layer as possible, and be as moist as is practicable.

Fire-Resisting Tests of Wooden Flooring.—According to a report in the *Carpenter*, a building inspector in Hamburg recently made a series of experiments to test the comparative fire-resisting qualities of different sorts of flooring. He constructed pieces of flooring, all of unplaned pine. The floor was double in every case save the first, and the boards ranged from 1½ to 2½ inches in thickness. The first floor, of single boards, burned through in 30 seconds. Then for the second and third experiments the floor was doubled—the joints running the same way. Two layers of asbestos paper were placed between the second piece of floor, and thick asbestos felt between sample three. The second burned through in 1 hour and 4 minutes, and the third in 1 hour and 13 minutes. The fourth and fifth samples were double floors, which resisted well. The sixth floor was like the fifth, save that the joints crossed each other at right angles. This floor required 1 hour and 22 minutes to burn through—the crossing of the joints being more effective than the asbestos paper or felt between the boards; and the resistance was prolonged somewhat. Ordinary roofing felt was placed between the boards in the tenth piece; and it resisted for 1 hour and 12 minutes. In the last piece, the upper floor was made of 1-inch match-boards; and the under planks were 2½ inches thick, with joints running at right angles with those of the upper flooring. Nothing was put between the floor; but the resistance was 2 hours and 24 minutes.

COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

A Series of Articles for Gas Students.

THE PURIFICATION OF CRUDE GAS (*Concluded*).

Materials other than those already mentioned have been used in connection with the purification of coal gas, with more or less satisfactory results. Mr. C. C. Carpenter, of Vauxhall, in his paper on "Purification," already quoted, refers to the employment of Weldon mud, and respecting which he has kindly furnished the writer with the following particulars for the purpose of these articles: Weldon mud contains approximately 25 per cent. of $Mn O_2$, with about 6 per cent of MnO and 4 per cent. of CaO. Its affinity for oxygen is greater than bog oxide of iron; and, like it, the admission of air with the gas plays an important part in maintaining its efficiency. It appears to have only a little more action on carbon bisulphide than oxide has; and though it has been found by some to remove several grains, its action in this direction is too small to be of use in reducing the sulphur compounds. It is decidedly lighter than oxide, and is indeed in a much more finely divided and chemically active state. It also gives less pressure; and this reduces as the material continues in use. On the other hand, the material does not revivify nearly so quickly as oxide; but this is of no moment if the process be carried on continuously *in situ*. Unlike oxide, it does not suffer depreciation from any carbonic acid that is passed into it; but the extraction of this is, of course, one of the fundamental economies of purification. The above is a brief summary of the *pros* and *cons*. Much has yet to be learned respecting the material; but so far, it certainly appears that Weldon mud is, at all events, much more to be depended upon than oxide of iron.

A process of purification by means of caustic soda and sulphide of sodium was designed and patented by the late Mr. R. H. Patterson; but it does not appear to have been employed on any practical commercial scale, and hence does not come within the scope of the present articles. The same remark applies with reference to other similar attempts to secure complete purification in closed vessels, including such processes as embrace the utilization of the ammonia contained in the crude gas, with which the names of Messrs. F. C. Hills, Laming, Livesey, Claus, and others, are so honourably connected. None of these have as yet successfully emerged from what may be termed the experimental stage; and it would appear highly improbable that any process essentially depending for its successful operation on so unstable a compound as ammonia, will ever prove commercially satisfactory.

Mr. Newbigging, in his "Handbook," already referred to, gives the following suggestions relative to the necessary capacity and area of purifiers as used in the ordinary way:—

> The capacity or purifying power of the vessel is determined more by its superficial area than its cubical volume. There is, however, a mutual relation between the two, as, when the depth is increased and fully utilized, the surface area has to be proportionately augmented, on account of the resistance offered by the deeper material to the flow of gas. It is more strictly correct, then, to say that the superficial area, in proportion to the depth of the purifying material, is the gauge of the capacity of purifying power of the vessels; and the maximum hourly or daily gas-make of which the works are capable should form the basis of any calculation to determine their size.
>
> One of the chief conditions for securing satisfactory purification is the use of vessels of large area. If economy and efficiency are to be considered, *time* is an important element, and must not be disregarded. The mere passing of the gas through the purifying media is not sufficient to ensure good results; time is required for chemical affinity to operate. . . . .
>
> Where there is intended to be four purifiers, three always in action, the maximum daily (24 hours) make of gas, expressed in thousands, multiplied by the constant 0·6, will give the superficial area in feet of each purifier.
>
> *Example.*—Required the superficial area of each of the four purifiers in a works equal to the production of 500,000 cubic feet of gas per diem of 24 hours.
>
> $500 \times 0{\cdot}6 = 300$ feet superficial area of each purifier.
>
> $\sqrt{300} = 17{\cdot}3$ (say, 18) feet side of square of purifier.
>
> In very small works where there is no exhauster, the constant 0·8 may be employed with advantage.

With the recent developments of oxide of iron purification, the employment of pure oxygen, and the use of other processes known and to be known, the circumstances which have provided the basis of such data as these are gradually undergoing transformation; and while the figures here given apply to the most usual methods as employed to-day, there is but little doubt that, in the course of time, it will be necessary to again re-investigate the matter, with a view to the preparation of such data as shall be based upon the latest developments and changes which are being, and have yet to be, introduced in connection with the purification of coal gas.

The sieves, trays, or grids used in the purifiers are so well known to the student as to require no more than this passing reference. Preferably of wood, they should, of whatever material, be thoroughly cleaned every time the box is emptied. If this be not done, they will be liable to add considerably to the back-pressure generated in the purifier, and to interfere with the efficiency of the purifying material.

ANOTHER DECISION FOR THE EDISON LAMP.

By Our American Correspondent.

Following the decision of the Circuit Court for the Southern District of New York, and really as a natural sequence to that decree,* the Edison Company, or its successors, the General Electric Company, have obtained an injunction against the Sawyer-Man Company (which means the Westinghouse Company), restraining them from making incandescent lamps of the description noted in the Circuit Court case. As a matter of fact, the injunction was previously granted *pro formâ*, in order to get the case up for decision; but hitherto it was inoperative. That case was tried before Judges Wallace, Lacombe, and Shipman, who filed their decision on the 15th of December. In the course of it they say:

The validity of the patent, and the infringement of its second claim by such lamps as the defendants make, were adjudged by the Circuit Court for the Southern District of New York, on July 14, 1891, in a decree at final hearing. That suit was brought against the United States Lighting Company, and was defended by the Westinghouse Electric Company—a corporation which, since Oct. 10, 1888, has been the owner of the business carried on in the name of the present defendants. The business of the defendants consists exclusively in the manufacture of the infringing lamps. The decree of the Circuit Court adjudging the validity of the second claim of the patent, and its infringement by lamps such as are made by the defendants, was, upon an appeal, affirmed by this Court Oct. 4, 1892. That decree, among other things, awarded the complainants a perpetual injunction. The present suit was brought subsequently to that affirmance. It is apparent that the order for the present injunction is, in effect, one to extend the terms of an injunction already granted in a suit determined by the Court of last resort between the same parties, or their privies, so as to include a new infringement.

For an understanding of the grounds upon which the defendants contend the injunction ought not to have been granted, the following narrative is necessary: For several years subsequent to 1880, the Edison Company and the United States Electric Lighting Company were the only manufacturers of incandescent lighting apparatus in America doing any considerable business. The United States Electric Lighting Company began manufacturing incandescent lighting apparatus, including the lamps which have been held to be an infringement of the Edison patent, in the summer of 1880; and they continued in such business until a recent period. In May, 1885, a suit was brought against it upon the present patent. Another corporation—the Consolidated Electric Lighting Company—was organized in September, 1882, and began the manufacture of incandescent lighting apparatus. This Company was the owner of, and operated under what are known as, the Sawyer-Man patents for electric lighting apparatus; and under these patents, it assumed that it had the exclusive right to make and sell the lamp claimed in the patent in suit. In May, 1885, an action was brought against it by the Edison Electric Light Company upon the patent in question; and about the same time it brought an action against the Edison Company for infringement of its own patent. In 1883 a corporation known as the Thomson-Houston Company began the manufacture and sale of electric apparatus for lighting and power. As the result of negotiations between the Consolidated Electric Lighting Company and the Thomson-Houston Company, the Sawyer-Man Company, the present defendants, was organized in September, 1886. Nine-tenths of its stock was owned by the Thomson-Houston Company. It received from the Consolidated Company a licence to manufacture lamps under the Sawyer-Man patents, and thereupon began the business of manufacturing the infringing lamp; and it has continued in this business to the present time. In August, 1887, all the stock of the defendants, including that owned by the Thomson-Houston Company, was sold to the Consolidated Company for $120,000 in bonds, and the same amount at par of its stock. In December, 1888, the Thomson-Houston Company sold its stock in the Consolidated Company to the Westinghouse Electric Company. At the same time, by an agreement between the Consolidated Company and the Westinghouse Company, the fulfilment of which on the part of the Consolidated Company was guaranteed by the Westinghouse Company, the Thomson-Houston Company was licensed, under the patents of the Consolidated Company, to make incandescent lamps for export and use with generating apparatus of its own manufacture in America; and the Westinghouse Company was prohibited from selling incandescent lamps for use with the Thomson-Houston generating apparatus for a period which might, at the option of the Thomson-Houston Company, extend to 1902. This agreement recognized the fact that the Thomson-Houston Company could, during the continuance of the agreement, make and sell lamps not covered by the Consolidated Company's patent; and in the event of such manufacture and sale, the latter Company was released from its obligation not to sell lamps for use in connection with the Thomson-Houston generating apparatus. Pending the suit against the United States Electric Lighting Company, the Westinghouse Company succeeded to the business of the United States Company, the Consolidated Company, and the defendants; and since September, 1888, the defendants have been the manufacturers of lamps for the Westinghouse system.

Each of the various companies engaged in the manufacture and sale of electric lighting apparatus has, as a rule, manufactured all the different pieces of apparatus which are necessary for making up a complete plant; the different parts being constructed with reference to use with each other, and not so as to be adapted for use in the systems of apparatus made by other manufacturers.

For the purpose of public lighting from central stations, local companies, known as illuminating companies, have been organized in various cities and towns, which have purchased plants from one or the other of the manufacturing companies, and the central stations of such illuminating companies have, as a rule, been equipped wholly with the electrical apparatus made by some one manufacturing company. In many cities and towns, there are competing illuminating companies using the systems of different manufacturers—some being equipped with the Edison system, some with the Westinghouse system, and some with the Thomson-Houston system. The United States Company has installed about 1050 plants, with a lamp capacity of about 350,000 lamps. About 300 of these plants were installed before the suit upon the patent was brought against it. The Consolidated Company also installed a large number of plants. After the Westinghouse Company succeeded to the business of the United States Company and the Consolidated Company, it also installed a large number of plants.

It is said that the aggregate lamp capacity of the incandescent lighting plants installed with generating apparatus supplied by the Westinghouse Company at the present time represents a capital of about $25,000,000, and a lamp capacity of upwards of 1,300,000 lamps. The lamps themselves represent but a small part of the cost of the plants—the greater part being represented by the electric apparatus supplied by the Westinghouse Company and its predecessors; but the lamps are essential for the continued operation of the plants. Unless the lamps can be replaced as they are worn out, and can be procured when needed, these plants will be crippled, and the greater part of the investment in them will be lost. The central station plants supply lights to consumers as gas companies supply gas; and if their operation should be stopped, great inconvenience to the public would ensue. The various companies give employment to a large number of men who might be thrown out of employment if the lamps could not be obtained.

In 1889 the Edison General Electric Company was organized for the purpose of combining the Edison Electric Light Company with various other corporations engaged in the manufacture and sale of electric apparatus—the organization of the subordinate corporation being retained. Prior to April, 1892, the Thomson-Houston Company had acquired the stocks of various other companies engaged in the business of manufacturing and selling electrical apparatus; and these companies were carrying on the business in combination with the Thomson-Houston Company, and under its control. In April, 1892, these two combinations—the Edison General Electric Company and the Thomson-Houston Electric Company—included substantially all the companies which had theretofore been competing in this kind of business, excepting the Westinghouse Company, and in that month the General Electric Company was organized for the purpose of joining these two combinations in one, which should include all the concerns in America, except the Westinghouse Company, which formerly were competing in the business of making and selling electric light and power apparatus; but the separate organization of the constituent companies was still retained.

The defendants insist that the preliminary injunction should not have been granted because—(1) Owing to the *laches* of the owners of the patent in asserting their claims and enforcing them, a large capital has been invested in the manufacture and sale, not only of the lamps, but also of electric lighting apparatus, which will be greatly depreciated in value unless the lamps can be used with it, and that an injunction will cripple and perhaps ruin the local illuminating companies who have invested in the plants of the Westinghouse Companies, if they are prevented from using the lamp of the patent, and thereby subject to great inconvenience those whom these plants furnish with light, and displace a large number of persons who are employed in operating the plants; (2) because the complainants, and the other corporations with whom the complainants are associated, the competitors of the Westinghouse Company in the business of making and supplying electric power and lighting, have entered into an unlawful combination to stifle competition in that business, and an injunction will be used unconscionably to further the objects of the combination; and (3) because, by reason of the affiliation of the Thomson-Houston Company with that combination, and the prior dealings of that Company with the defendants, the Consolidated Company and the Westinghouse Company, an equitable estoppel has arisen, by force of which the complainants, as parties to the combination, ought not to be permitted to have an injunction. The question whether there has been any *laches* in asserting the patent was considered by the Circuit Court of Appeals, upon the appeal from the decree of the Circuit Court, and that Court declared that no case was shown to authorize the refusal of an injunction on any theory of *laches* or equitable estoppel by reason of undue delay in bringing suit, or acquiescence in known infringement. If the owners of the patent proceeded with due diligence as respects the United States Lighting Company, no other infringers of the patent can be heard to complain with reason that suit was not brought against them upon the patent previous to the adjudication of its validity in the Circuit Court. It is a matter of notoriety that that litigation was a very expensive and arduous one; and its progress must have been familiar to all those who were extensively interested in having the patent defeated. As regards the present defendants, there are no new facts of importance bearing upon the question of *laches* to distinguish the case from that shown in the former suit. We see no reason for changing the opinion expressed by this Court in the former case; and we do not deem it necessary, because the same defence has again been urged upon substantially the same state of facts, to add anything to that opinion.

Every one of the manufacturing corporations, the competitors of the Edison Companies, commenced their operations with a knowledge of the existence of the patent in suit. They were controlled by business men of intelligence and experience. Their promoters and managers may have believed, and probably did believe, that the patent could not be successfully maintained. But they entered upon the business with an understanding of its risks, and of the consequences which would befall them as infringers if the patent should be sustained. None of them can now be justly heard to say that an injunction which is essential, if not indispensable, to the protection of the owners of the patent and their licensees, ought not to be granted because of the great pecuniary loss which may result. If, in consequence of being deprived of the use of the lamps, their investments in other electric apparatus will be greatly depreciated, they must take the consequences. The users who have supplied themselves with electric lighting plants from the infringers, which required for their operation lamps of the patent, are, of course, infringers.

* See JOURNAL, Vol. LX., p. 1124.

But those who did so before the decision of the Circuit Court sustaining the patent, and at a time when judicial decisions in foreign countries interpreting the patent were in conflict, and who are now willing to accept their lamps from the complainants upon reasonable terms, have much stronger equities than the manufacturing infringers. These equities the Court will not disregard; but what would be reasonable terms if an application were made to the Court on behalf of these users, is a question which can only be determined in each case upon its particular circumstances. As to those users, however, who have acquired these plants subsequent to the decision of the Circuit Court, if they are deprived of the use of the lamps, and the value of their plants may be greatly impaired as the result, they must accept that result as a consequence of their own imprudence.

We are not supposed to investigate, upon the present case, the character of the combination which has been formed under the name of the General Electric Company. Whether or not that combination is intended to fetter competition, and is illegal as one in restraint of trade, is a question which we should not undertake to decide upon the evidence before us, and in a suit to which it is not a party. The present complainants are entitled by the patent laws to a monopoly, for the term of the patent, of the manufacture and sale of the lamps made under it. The right to this monopoly is the very foundation of the patent system. They do not lose that right merely because they may have joined in a combination with others holding other patents securing similar monopolies, which combination may, when judicially examined in a proper forum, be held to be unlawful. We do not feel justified in assuming, upon the facts before us in the present suit, that the use which the complainants propose to make of the injunction—an injunction which seems necessary to secure their monopoly and make their patent fruitful—will be such as to promote any other monopoly. When it shall be made to appear that someone, to whom in fairness and good conscience these complainants should sell their lamps, has been arbitrarily refused them, save upon oppressive and unreasonable terms, it will be time to consider whether the complainants should be allowed to continue in possession of the injunction.

The alleged estoppel seems to be far-fetched and shadowy. The history which has been given shows that, before the Sawyer-Man Company was organized, litigation upon the patent in suit and upon the Sawyer-Man patents had commenced; that in 1887 the stock in the Sawyer-Man Company owned by the Thomson-Houston Company was sold to the Consolidated Company, a party to the suits; and that subsequently, in 1888, the Westinghouse Company—an actual party to the litigation—bought from the Consolidated Company that portion of the stock which had been owned by the Thomson-Houston Company. The estoppel lacks the elements which ordinarily create an estoppel in *pais*—namely, an injury or harm to one person resulting from a reliance upon the acts, conduct, or declarations of another, in which there was an element of bad faith or wilful neglect of duty. The history of the connection of the Thomson-Houston Company from 1886 to 1888 with the Consolidated Company, and with the Sawyer-Man Company, the defendants, shows that all these Companies knew of the existence of the litigation in which the life of the present patent and of the Sawyer-Man patent was at stake. There can be no charge of concealment or constructive fraud. When the sale and agreement of 1888 were made, there was no implied obligation upon the Thomson-Houston Company to remain in alliance with the Westinghouse system. The contingency that it might enter upon the manufacture of competing lamps was contemplated. Its union with the Edison interests has neither hastened nor facilitated the application for the present injunction. We perceive no adequate reason, from the facts, why the complainants should not obtain the ordinary results which attend a complainant's success in a suit in equity for the infringement of a patent.

The injunction order appealed from should be modified so as to cover only lamps made in infringement of the second claim of the patent; the other claims not having been infringed according to the adjudication of the Circuit Court or of this Court. It should also contain a provision reserving the right to the defendants to move hereafter for the vacation, suspension, or modification of the injunction upon proof of specific instances of refusal on the part of the complainants, or either of them, to supply the lamps of the patent, upon terms reasonable under the circumstances of the particular case, to the owners of electric lighting plants which were installed before the rendition of the interlocutory decree of the Circuit Court sustaining the validity of the patent.

It will be seen from this order that it will be quite necessary for the Westinghouse Company to perfect a lamp which shall be novel as regards other patents, and at the same time be practicable. The outcome will be awaited with interest.

Clearing Obstructed Gas-Pipes.—According to *Industries*, alcohol has been found efficacious as a solvent, in place of chloride of calcium solution, of obstructions in gas-pipes. The burner is unscrewed; and a small quantity of methylated spirit poured down the pipe.

A Study of Water-Mains.—An interesting study of water-distributing mains has recently been made by Mr. A. Rinker, late City Engineer of Minneapolis (Minn.). There are 200 miles of pipes in this city; and Mr. Rinker has divided this mileage into zones showing the quantity lying within each 25 feet of elevation above the floor of the pumping-station, 100 feet above the city datum. Only 1·4 per cent. are below the floor, 18·7 per cent. are in the first zone, 49·4 per cent. in the second, 4 per cent. in the third, and 1·2 per cent. above that level. These figures were obtained in an investigation to show the necessity of high and low service districts. When full, the mains contain 5,616,300 gallons, 95 per cent. of which lies at an elevation not exceeding 50 feet above the floor of the pumping-house. Mr. Rinker recommends converting this 95 per cent. into a low-service system, operated with a pressure of 50 lbs., and provided with independent pumps for high office buildings.

TECHNICAL RECORD.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of this Association was held last Thursday, at the Holborn Restaurant. At the commencement of the proceedings, Mr. A. DOUGALL (Tunbridge Wells), the retiring President, occupied the chair. Despite unfavourable weather, there was a fair number of members present.

The minutes of the meeting held in November last having been taken as read,

The retiring President introduced his successor—Mr. C. C. Carpenter, the Engineer of the Vauxhall works of the South Metropolitan Gas Company, who, on taking the chair, was greeted with a hearty welcome from the members.

ANNUAL REPORT.

The HON. SECRETARY and TREASURER (Mr. J. W. Helps, of Croydon) then read the annual report of the Committee as follows:—

In presenting the annual report of the Association, the Committee feel that they may fairly congratulate the members on the continued prosperity of the undertaking, and the useful and pleasurable character of the proceedings at the several meetings held during the past year.

At the annual meeting, held on the 9th of March last, the President—Mr. A. Dougall, of Tunbridge Wells—delivered a most interesting Inaugural Address. In briefly dealing with matters that had come within the range of his own experience, he succeeded admirably in describing the construction and methods of working adopted in a modern gas-works, and presented to his hearers much valuable information, and many ideas as to the management of gas undertakings well worthy of consideration.

By the kindness of the Directors of the Tunbridge Wells Gas Company, the President was enabled to invite the Association to hold the May meeting at the works under his charge; and the members were most cordially received by some of the Directors, and by the Secretary, Mr. J. Read. It was doubtless a matter of gratification to all connected with the Gas Company to conduct their visitors through works so well arranged, and containing such fine examples of gas engineering, maintained in the highest condition of working efficiency. After inspecting the works, the members were most hospitably entertained at a luncheon provided by the Directors of the Company; and the party then proceeded to Penshurst, where, by the kind permission of Lord de Lisle, they were shown over Penshurst Place, which has many historical associations, and contains pictures and other works of art of great interest. The drive home in the summer evening was a very enjoyable conclusion to the day's proceedings.

The next meeting of the Association was held on the 10th of November, at the Holborn Restaurant—Mr. Dougall presiding. Mr. C. C. Carpenter, of Vauxhall, read a paper on "Purification," in which he dealt with the effects of atmospheric air as used in the elimination of sulphur compounds from coal gas. In this, as in other matters connected with the manufacture of gas, Mr. Carpenter has struck out a distinct line for himself. His paper and the discussion which followed will doubtless form a valuable addition to the literature of the subject. At this meeting Mr. Carpenter was unanimously chosen President for the ensuing year. Messrs. W. A. Valon and J. Tysoe were elected to the Committee in place of Messrs. S. W. Durkin and Corbet Woodall. The gentlemen who have kindly consented to act as Auditors are Mr. W. H. H. Broadberry (re-elected) and Mr. C. E. Botley, who will fill the vacancy occasioned by the election of Mr. Carpenter as President. Our excellent and highly-esteemed Honorary Secretary, Mr. J. W. Helps, again consented to fill the position for which he is so especially suited; and the Committee gratefully acknowledge how much both themselves and the members owe to his exertions on their behalf, and to his tact in securing the interests and maintaining the most worthy objects of the Association.

The finances of the Association have been conducted on the principles advocated, although not practised, by Mr. Micawber; expenditure being kept just within income—result, happiness. The receipts for the year 1892 were £52 8s., while the expenses amounted to £50 12s. 1d.; leaving a small balance to add to that already in hand—raising the sum carried forward to £44 6s. 3d.

The number of members at the end of 1892 was 91. Six new members were admitted to the Association during the year. On the other hand, its numbers were reduced by one resignation and by two deaths—viz., those of Mr. C. C. Broadberry and Mr. John Somerville. The last-named gentleman was a Past-President of the Association, and one of the most frequent contributors to the proceedings of the meetings; while his unvarying kindness of disposition secured to him the love and respect of all with whom he came in contact. His memory will, we feel sure, receive due recognition by the members at the forthcoming meeting.

The Committee trust that the friendship and good feeling which have always existed among the members of the Southern District Association will be continued, and that each one will exert himself to contribute in some way to advance the objects of the Association, and so assist the industry we represent to hold its own against all competitors.

On the motion of Mr. T. PRICE (Hampton Wick), seconded by Mr. A. F. BROWNE (Rotherhithe), the report was adopted.

THE LATE MR. JOHN SOMERVILLE.

The PRESIDENT said that, since the last meeting, the Association had unfortunately sustained a severe loss in the death of Mr. John Somerville. It was felt by the Committee that it would be better if some steps were at once taken to convey to Mrs. Somerville the deep regret with which they heard of her husband's decease, instead of waiting for the present meeting.

The Committee were immediately called together; and a vote of condolence was passed and forwarded to Mrs. Somerville, who had acknowledged it. He now asked the members to confirm the action of the Committee in this respect.

This was done without further remark.

THANKS TO THE EX-PRESIDENT.

The PRESIDENT said that he had next to perform the agreeable duty of proposing a vote of thanks to their Past-President, Mr. Dougall. They had had very pleasant demonstrations of what an excellent choice was made when that gentleman was selected to occupy the presidential chair; and he was sure that any words he could say on the subject would indeed be to "paint the lily" or "perfume the rose." He would therefore move that the best thanks of the members be given to Mr. Dougall for the manner in which he had discharged the duties of his office during the past year.

Mr. W. H. H. BROADBERRY (Tottenham) having seconded the motion, it was carried by acclamation.

Mr. DOUGALL sincerely thanked the members for their cordial recognition of his services, and said that it was only after some hesitation that he accepted the position of President, feeling, as he did, his inability to properly discharge the duties pertaining to the office. Therefore the hearty way in which the members had signified their approval of what he had done was very gratifying. He trusted that the kindness shown him during the past year would be extended to his successor.

NEW MEMBERS.

Mr. C. S. Ellery, of Bath, and Mr. W. Owen, of Horley, were elected members of the Association.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

First let me thank you for your graceful tribute to the Company with which I have the honour to be associated in choosing, for a third time, a President from its officials. Indeed, I cannot but feel that it is to its untiring efforts in the advancement of the great industry with which we are all connected, rather than to my own small labours, that I owe the honour of occupying your presidential chair to-day. Be this, however, as it may, and since I must necessarily lack those attributes of position and experience which my predecessors have enjoyed, let me ask you all the more earnestly to lend me your cordial aid, that the present year of the Association's work may be not less successful than has been its past.

Foremost among those who have contributed to this success, the name of John Somerville will ever be gratefully remembered. Since our last meeting he has gone, alas! from among our midst, to that undiscovered country from whose bourne no traveller returns. Of us who sorrow at his loss, to some he was a helpful colleague, and to all a friend whose stores of knowledge and experience were ever open to our wants. May he rest in peace!

It has been with me a matter of some little difficulty to choose what, to borrow a German expression, I will call the *motif* for my address. It is not in my power to give you such a treat of ripe wisdom as it has been my own lot to sit and enjoy from the lips of some who have gone before me in this position. I therefore propose shortly to glance at some of those matters in which the records of 1892 show progress to have been made, to touch upon one or two points affecting the still vexed question of purification, and, finally, to say a word of reference to some of the work this Association has contributed, pointing out the great extent of problems that yet remain unsolved, and the most promising direction in which improvement may be sought.

If it can be said of any one subject more than another that it has been largely occupying the attention of gas engineers, this may be truthfully stated of carbonizing. In most other directions, progress has been effected on certain well-defined lines; the difficulty being for the great part either of mechanics or of policy, and thus permitting an easy stating of *pros* and *cons*. But the use of sloping retorts, though not exactly involving the turning upside-down of our retort-houses, yet goes sufficiently far in that direction to make the consideration of their claims a very serious matter. Let us at the outset state the problem to be solved. This is simply, "How can we most economically carbonize our coal?" Now carbonizing coal does not consist in putting coal into a retort, and, after a given time, drawing out what is left behind of it. There is a chemical as well as a mechanical efficiency to be reached; and these unfortunately lie in opposite directions. Mass, which fills with joy the heart of the engineer, is an equal sorrow to the chemist. The one would like a retort taking, say, 100 tons at a charge; the other, a 100-grain sample in a combustion-tube. How nearly can these two antagonisms be brought into line? Well, in whatever ideal carbonizing may consist, a near approach thereto will, I believe, be found in operating upon a layer of coal as thin as possible, as even as possible, and with as regular a degree of heat as possible. The statement of these conditions is not new. It has, in essence, been made before, I believe, by the occupant of this chair; but I lay stress on them now because there seems great danger of their being overlooked.

Be it remembered that the products of the distillation of coal are not of uniform, but of very varying, composition from beginning to end of the operation. In a paper read before you by Mr. Folkard in 1887, he stated that so deleterious indeed to luminosity was the gas given off at the tail-end of the charge, that not zero, but a high *minus* quantity must be assigned to it. His careful experiments are weekly confirmed by most of us who stop working on Sundays; for we know that the mixture of the Sunday morning and Sunday night gas requires extra enrichment to produce a quality equal to the daily average. To better explain the bearing of this in relation to ideal carbonizing, I will take, as an example, another operation with which you are familiar—viz., the action of a lime purifier into which gas containing carbonic acid is passing. After a time, carbonic acid shows on its outlet; and if, on account of its prejudicial effect on the illuminating power, all traces had to be kept out of our finished gas, we should have to put to work another purifier. When this happens, however, would the lime have become completely carbonated? Certainly not. A large proportion would still be existing as virgin lime, simultaneously with the free passing of carbonic acid. The reason of this is, as you well understand, that the lime is not uniform in texture or closeness—that is, in its physical condition as it rests upon the sieves; one portion offering less resistance or less affinity to the gas than another.

Now, mark the analogy. What happens in ninety-nine out of a hundred lime purifiers happens to the charge of coal in a retort. At a time when a gas, valuable in illuminating constituents, is still being evolved from the thicker or closer portions of the coal, it is being polluted, so to speak, by that coming from other and spent parts, just as with our lime purifier the carbonic acid got forward from the purifier, while a considerable margin of efficiency still remained with the material. If, however, the process of carbonizing be made to conform with the conditions I have laid down—that is, if the coal is of even texture, in an even layer, and uniformly heated, the change from *plus* through zero to a *minus* quantity of illuminating power takes place simultaneously throughout the entire volume of the evolved gas, and permits the charge to be drawn at the proper instant, with a resultant minimum of waste.

Here, then, is laid down one standard by which we may measure the efficiency of any system of carbonizing we may be called upon to examine. Do those involving the use of horizontal or of sloping retorts equally comply with it? Well, I am bound to admit that I have not yet seen any system of inclined retorts in which this condition is met as satisfactorily as it is with scoop-charged horizontal retorts. But we must be careful not to condemn sloping retorts on this account; for, on the other hand, they may possess other advantages more than counterbalancing any loss in what we will call coa lefficiency, or, indeed, means may be suggested whereby this too may be avoided. One of our most practical carbonizers realized the importance of this difficulty, and made a very notable attempt to overcome it. I refer to the invention by Mr. G. C. Trewby of his charging-plate, the mechanism and use of which is fully described and illustrated in the Transactions of the Institution of Gas Engineers for 1891. But, however successful it may be in accomplishing its object, we must not forget that it entails the re-instatement of machinery in the retort-house, which the advocates of sloping retorts proposed wholly to displace.

Before leaving chemical for mechanical considerations in our comparisons, I would say just one word on what we will call a physical matter, forming, as it were, a link between them. I allude to the difficulties attending the heating of sloping as against horizontal retorts. However troublesome these difficulties may have been, I do not look upon them as insuperable or, indeed, serious. It would not be possible to say of a good many settings of horizontal retorts that they were regularly and evenly heated; and I think it will be found that similar causes are existent in either case. I believe I was one of the first to point out, in a paper read before The Gas Institute in 1888, that the composition of the gases coming therefrom varied at different parts of the producer, and that, as these were also of unequal temperature, good results could only be obtained by allowing them to mix before they were admitted to the setting. I also showed how a non-appreciation of this had led some designers to reduce the size of the nostrils as these receded from the furnace. A common fault, too, was to make the combined area of these so great that there were not sufficient gases to distribute themselves over all of them. With sloping retort-settings, on account of the greater ascension of the gases, the more the nostrils rise in level the smaller should be their area; and if the mistake of making those too large at the outset were avoided, it should not be difficult to experimentally determine the proper dimensions, and fix them once and for all.

There now remains to be considered the mechanical efficiency of the two systems; and these we may conveniently subdivide into labour and wear and tear charges. At London prices, carbonizing wages may be assumed as 3s. per ton for horizontal hand charging, as against 1s. 6d. per ton for sloping retorts. But that the comparison should be fair, it must be made as between machinery, instead of hand stoking. This has been at various times differently stated, but would certainly not exceed 1s. 6d. per ton carbonized. So, therefore, our first equation resolves itself into interest on outlay and wear and tear of machinery, as against interest on outlay and wear and tear of sloping over and above that chargeable to horizontal retorts. Our thoughts are thus impelled towards the consideration of what forms of machinery are at present available for working horizontal retorts. Of the many contrivances which have been suggested

for this purpose, two systems appeal strongly to our notice—the hydraulic machinery of Mr. Foulis, and the compressed air machinery of our Past-President, Mr. West. Fortunately, these gentlemen are of wide experience as gas engineers; and their friendly rivalry cannot fail to be of service to our industry. Apart from their motive power, the two systems have no resemblance to one another; and an examination of their synthesis is an interesting one. It is the practice in the North to charge cannel coal with the shovel; while in the South, the scoop is pretty generally used for caking coal. The Foulis (or rather the Foulis-Arrol) charger reproduces, in a sense, the action of the shovel, in that each charge of coal is pushed in successive portions into the retort; the pusher (a sort of rake) shortening automatically, until the operation of charging is complete. In the latest and most improved form of the West machinery, a scoop is used holding 2 cwt. of coal; two constituting a charge. I have lately had an opportunity of inspecting, at the Old Kent Road works, this, the latest, evidence of Mr. West's persistent efforts; and I am bound to admit that no installation of retort-stoking machinery I have yet seen has pleased me so much as did this one. Mr. West has greatly improved not only the efficiency of his machines, but also that of his air-compressing engines, and with extremely satisfactory results. In fact, the whole of the plant is well worthy of a visit by all interested in this important question. In the above comparisons, I have made no mention of the rake or drawing machine, as the designing of this does not present very great difficulties to the engineer.

In 1886 I had the honour of making my first appearance before this Association, as the reader of a paper on a new system of retort heating; and it is a curious circumstance (which it may not perhaps be out of place to mention) that, in my present year of office, these identical retorts will be re-set, after an average life of over 1800 working days. As regards the cost of attending to the furnaces, the 8-hour movement has since intervened; but it may be interesting, for the purpose of comparison with the figures originally given, to state that this charge is now, for a house of 180 through retorts, 18s. 9d. a day of 24 hours for fireman's wages, *plus* 10s. for cleaning out the ash-pans.

Following in importance the year's progress in retort-house machinery, comes the large substitution of oil for cannel as a means of enriching coal gas. Undoubtedly, the simplest of the various methods which have been proposed for doing this is the Clark-Maxim process, in which light petroleum spirit of about ·680 specific gravity is vaporized under pressure, afterwards mixing automatically with the stream of ordinary gas. The question frequently asked in reference to it is, "Does the vapour travel?" In my own case, the works photometer and that at the testing-station do not give the same results by, as nearly as may be, 1 candle. But this difference is the same in midwinter as at midsummer; while the jet photometer gives identical results in both cases. If further proof were necessary of the stability of the vapour, there remains the fact that but little is found in the syphons between the testing office and the works, though these are 2 miles apart. More interesting still, however, is the advent in London of carburetted water gas, already used extensively in the United States, and now being made on a large scale by The Gaslight and Coke Company. Its use does not, however, appear to be attended with the extent of success which was first expected of it; an important governing factor being the cost of oil. It was hoped that crude oil could have been used for the purpose of carburetting. But repeated experiments have resulted in failures; and recourse has had to be made to refined Russian oil, known as "Solar Distillate." The Springer plant erected at the Old Kent Road works was designed to overcome this difficulty, by vapourizing crude oil in separate retorts, afterwards passing these vapours into the carburetter. The process has, however, not turned out a success; and the only plant now being operated in London upon a large scale is that known as the "Improved Lowe." Whatever possibility there may be in the future for the use of water gas, it is at present an open question whether it is of much greater value than as a ready means of raising 16-candle coal gas up to the 17 candles now found necessary in order to meet the requirements of official testing.

I cannot refrain from here adding my plaint to what we will call the "bitter cry" of the London gas engineer on this testing question. None but he knows what it means; and he must often sigh for the peace and comfort the control would give of such an undertaking as one of the largest Corporations in the North, whose Gas Examiner has recently reported that over 52 per cent. of the total year's tests were below the standard of illuminating power. Before quitting the subject of water gas, you will be pleased to hear that our friend Professor Lewes has been busily engaged upon a new process of his own, which bids fair to be a great improvement on present methods, and which is not less interesting as being the result of his patient and laborious investigations into the most economical means of using oil, with much of which work you are familiar through his published utterances upon the subject.

There still remains a third method of enrichment—the use of oil gas; and no less an authority than Mr. W. Foulis has stated reasons for his belief that this method will be found to give the most satisfactory results of all. For further extension of our knowledge on this point, we shall doubtless be chiefly indebted to our *confrères* in the North, who are the more concerned therein, since their standard of illuminating power is considerably higher than ours. Especial interest will attach to the process of Mr. W. Young, as carried out by him at Peebles, and who appears, by what we may call the persistent distillation of the oil, to split it wholly up into hydrocarbon vapour or gas and free carbon, which is left behind in the retort in the form of a saleable coke.

Reference to the enrichment of coal gas would be incomplete without some allusion to a knotty problem which has vexed a good many minds, and is, it appears, still far from solution—viz., What is the most suitable quality to take as the standard for illuminating gas? For it must be remembered that, since these were settled in the earlier days of the industry, the conditions of supply have radically changed. Gas is no longer distributed solely for consumption in union or batswing burners for light-giving purposes; but also for cooking and heating, for motive power, for use in regenerative lamps, and as Bunsen flames within the mantles of the still more economical Welsbach burner. It may be taken as certain that the scientists' dream of a dual supply of heating and lighting gas is beyond the sphere of practical possibility; and it is therefore necessary to arrive at an average between the extremes of non-luminous heating gas and (say) 30-candle illuminating gas, at which the consumer can be supplied with the greatest economy to him. I am strongly of opinion that this result is not represented by the quality it has now become necessary to supply in London, and that, for the money spent by the consumer in enriching material, he does not get a proportionate advantage. May I here throw out the suggestion that a paper on the subject would form a very good text for discussion at one of our November meetings?

As the engineering achievement of the year must undoubtedly be ranked the East Greenwich holder; the successful working of which throughout the past winter having triumphantly vindicated the boldness and originality of its design. Of especial interest was the safe cupping and uncupping of the inner lift, the proportions of which are, as graphically stated by Mr. Livesey, those of the thickness of two penny pieces compared with their diameter. This result has been ensured by making the guide-rollers a combination of the radial and tangential types, and by taking means to ensure their being kept tightly up to their work. In the first gasholder for which I was inspector, it was laid down for my guidance that, in adjusting the inner rollers, space equal to the double thickness of a wooden rule was to be left between them and the channel-iron roller-path. It is quite likely that this open practice, coupled with the not uncommon want of rigidity in the bottom curb, had something to do with those early failures which led to the formulation of the rule contained in the text-books as to the relative proportions of the diameter and depth of gasholder lifts. The advantage of large holders as affording a cheap means of meeting the ever-increasing demands upon storeage capacity, were cogently stated by Mr. Livesey in describing this holder at the meeting of the Institution of Gas Engineers last May; and as the paper was very fully and completely illustrated, I must refer you to it for the full details of what is, in truth, a monumental work. It is, however, known to most of you that two lifts go out beyond the framing. But from this it must not be presumed that this indicates any approach in Mr. Livesey's practice to the abolition of guide-framing. On the contrary, he himself has pointed out, in a letter to the JOURNAL OF GAS LIGHTING, that these two lifts form but one-third of the total height of the holder, and beyond which he does not consider it expedient to go. I think the large majority of engineers will wholly agree with him, and that, although the system of guiding a holder from the base is delightfully ingenious, its application is only possible to holders on a very much smaller scale indeed.

No reference to the past year's teachings would be complete without mention of the disastrous explosions which have occurred in liquor and tar wells. Familiarity with danger breeds, in most cases, a contempt of it; and this becomes reprehensible if coupled with it is neglect of any and every possible precaution against accident. The presence of explosive mixtures in tar and liquor wells is easily accounted for, without any abstruse theory, by the crude gas which is carried forward mechanically through the seal cups, and by sulphuretted hydrogen evolved from the liquor. Efficient ventilation is probably the best and only safeguard; but, in carrying this out, care must be taken that no loss of ammonia, &c., ensues. I find this is easily done by placing small scrubbers (formed out of 18-inch pipe, and filled with coke) in connection with one or more of the tar and liquor wells. The top of this pipe is carried up out of harm's way; and its contents are kept constantly wetted with fresh water from an automatic syphon discharge. I have long looked with suspicion on the ordinary so-called safety-lamps of plate glass and gauze, as something of a danger trap, and have now almost wholly displaced them by electric hand-lamps. The incandescent carbon of these is protected by two glass globes, and is so arranged that, if the outer one of these is fractured, the lamp is automatically cut out of circuit. All possibility of sparking is eliminated by using a self-contained primary battery of zinc and carbon couples to produce the current.

The increased attention given to the problems involved in purification may be taken as a sign of the times, that engineers are looking more closely than ever into every detail of gas

manufacture; and purification cannot be considered an unimportant one. One of our Past-Presidents, Mr. May, has already dealt very ably with the subject in the address he delivered before you three years ago; and in a paper which I had the honour of reading before you at our last meeting, I gave some results which were obtained on a large scale at Vauxhall. And though the two busy winter months afforded little leisure for investigations, yet I should not like to omit from this address one or two points of interest, although no opportunity is here afforded of their being discussed. A few words may not be out of place as to the desirability or otherwise of removing sulphur compounds. Excluding capital charges, we may take the cost of purification in London at (say) ¾d. per 1000 cubic feet for materials and labour. Now, concurrent with sulphur elimination is that of carbonic acid. Taking the original volume of this at 1½ per cent. of the scrubbed gas, the depreciation in illuminating power due to its presence in that quantity would be about ¾ candle. The cost of enriching 1000 cubic feet of common gas by 1 candle has been variously stated by several investigators. But taking 1½d. as the minimum would give 1⅛d. per 1000 cubic feet as the value of the increase in illuminating power due to the extraction of the carbonic acid, from which, however, must be deducted, as before stated, the capital charge due to increased plant over and above that required for oxide.

I will now give you a few details of the results obtained when working lime purifiers in the way I described to you last November. This, you will remember, consisted in part of putting a known percentage of air into the fourth or third vessel of a rotation set. We have since been able to go a step farther. At the time when a clean lime vessel is put on, we are passing large quantities of sulphuretted hydrogen into the oxide vessels. Air, too, is put in at the stated rate. But after about 24 or 36 hours it is shut off, and appears to be not again necessary. Should this, our present experience, be borne out in continued practice, further advantage will be gained from the greatly reduced average quantity of air required to bring about the reactions. But the criterion of effectiveness in any system must be based upon the composition of the material rejected from the purifiers as spent lime. We are able to work up to 80 per cent. of carbonate of lime in our waste, which also contains from 8 to 10 per cent. of free sulphur. The latter is, of course, valueless, and a dead loss. It should all have been deposited in the oxide of iron purifiers; for I affirm that ideal working would not be to get as much sulphur as possible into the lime, but at least only that existing as bisulphide of carbon, the remainder of the lime saturated with carbonic acid, and the whole of the sulphuretted hydrogen driven forward into the oxide of iron, whence it can be more profitably extracted. The analysis I have given shows that progress is being made towards the goal defined. Moreover, lime purification, carried on as described, is productive of few, if any, more difficulties, as regards smell, than are attendant on the discharging of an oxide box. The spent lime is of a greyish-blue colour; and, excepting that composing the top layer, very dry and friable. The cause of the objectionable wetness of the top tier became matter for further investigation. In a rotation series of four boxes, the gas in two was arranged to flow upwards, and in two downwards; but in either case the top layer was always found to be wet. On reflection, it appeared that the cause was to be found in the water vapour rising from the lutes—a matter of greater importance, as the purifiers are worked at a temperature of between 80° and 90° Fahr. The lutes were then covered with oil in sufficient depth to prevent any loss of water. The same plan has also been adopted with the oxide of iron and Weldon mud vessels, with, so far, very satisfactory effect. Do the above-enumerated results leave any margin of advantage for the substitution for air of pure oxygen? I venture to think not, and that chemical reasons are but confirmatory. I have elsewhere directed attention to the importance of temperature to the reactions involved in purification. If a stream of carbonic acid gas be passed into a small bulb containing slaked lime, the heat of combination is such as to rapidly raise the temperature from normal to over 150°; and when sulphuretted hydrogen is passed into oxide of iron or Weldon mud, the action is even more energetic. Professor Dewar has found that, at low temperatures, chemical action ceases between substances having normally great affinity for each other. Is not all this presumptive evidence in favour of so protecting the vessels in which the reactions called "purification" occur that their temperatures may be wholly under control, and protection afforded from the rigours of our climate? I shall not, indeed, be surprised if further investigations do not result in finding 150° a better working temperature than 50°.

It seems probable that we are at last within reasonable distance of possessing a real standard of light for photometrical purposes. Impressed with the extremely unsatisfactory character of the present one, the South Metropolitan Gas Company, which is nothing if not progressive, offered to pay the whole costs of an inquiry by a Committee of experts into how it might best be replaced by a more exact and reliable one. This Committee is now sitting; and it is no secret that its investigations are being made as exhaustively and thoroughly as can be imagined. But there are circumstances of great interest to be related as to the part this Association has played in bringing about the solution of this long-deferred problem. I refer to that most able paper on "Photometry," read before you by our friend and Past-President, Mr. Methven—a memorial of such persevering and painstaking labour as few Associations can number among their records. So impressed, indeed, were the Council of the Institution of Gas Engineers with the value and importance of Mr. Methven's researches, that at its meeting in May last a resolution was carried, and afterwards forwarded to the Board of Trade Standards Committee, asking that the Institution should be heard before any conclusions were come to. This request—the first step taken by any Institution to place itself in touch with the Committee—was courteously received; and, as a result, the Council drew up certain recommendations, which, as they have since been prematurely published, there can be no harm in detailing. They are as follows: "That attention be drawn to Mr. Methven's experiments showing the influence of the hygrometric condition of the atmosphere upon the pentane standard of light; correction for that source of error appearing to be necessary to enable the pentane candle to be used for standardizing." "That air carburetted with pentane be used for testing purposes." "That a multiple of the standard candle equal to 10 candles be produced for testing purposes by the application of a screen to an Argand burner; and that all tests be performed with an open bar photometer not less than 60 inches in length." "That the rate of consumption of the gas to be tested be adjusted as nearly as practicable to the maximum efficiency of the various standard burners." Now, if you will refer to Mr. Methven's paper, you will notice how largely the above recommendations were based upon it; and, further than this, I may say there is reason to believe that the experiments made to verify their accuracy, under the direction of the Standards Committee, have more than borne them out. So, gentlemen, I think you will agree with me that this Association may well be proud of having been the means of bringing prominently under the notice of the gas industry this important question; and I am sure the Institution ought to be exceedingly grateful for having such valuable material ready to its hands.

I cannot here refrain from quoting from a paper read last year before the American Gaslight Association by Mr. W. R. Addicks. In it he points out the advantages which would accrue to the gas industry as a whole by the federation of its various Associations. Replying to the question: "What organization would meet this case?" he proceeds as follows: First, a national association, with active members composed of the engineers and managers of gas companies; secondly, district associations, with active members composed of engineers and managers of gas companies in the given districts. Membership in a district association would not necessitate membership in the national association. A journal of proceedings to be published by the national association, but containing also the reports of the district associations. The national association to meet yearly in the spring, when the greater number of members could be present; district associations, three times a year. He goes on to define the composition of the council and committees, and finally directs attention to one or two matters of importance, the co-operative investigation of which would bring about greatly improved results. Gentlemen, the American nation can afford to give us a good many points from a federation point of view; but is it not possible that, as regards an industry which we can call especially our own, we may take the wind out of their sails by bringing about, in our Mother Country, such a federation of gas associations as our American *confrère* has sketched out? It would, I heartily and earnestly feel, be a good thing for all if the Year of Grace 1893 should witness the bringing about of a consummation so devoutly to be wished.

Now, gentlemen, before bringing this address to a close, I must not forget that presidential crotchet without which none would be complete. My own especial one will take the form of an earnest plea for the larger inclusion in the daily routine of gas manufacture, of experimental work in connection with the chemical aspects of the problems involved therein. Let us not take for granted that our present systems and methods are perfection, and spend the whole of our time in devising mechanical improvements in carrying them out. Let us probe them to their very bottom, and ask ourselves whether, for instance, our present system of carbonizing coal is chemically correct or radically wrong; whether, in its present form, it may be vastly improved; or whether there is justification for the belief that our conceptions of it are erroneous, and must be formed *de novo*. The chemist can never take the place of the engineer. But while I strongly hold that some real chemical training is an important advantage to the latter, yet the chemist should have to him the same relationship, and hold the same position of importance, as does his assistant or his draughtsman. Look at the part the spectroscope has played in some of the important industries of the country—I will take two dissimilar ones—steel making and sugar refining. Can this instrument not be brought into our service? Could we not make the collection of the gases evolved in carbonizing coal a selective one; retaining what is good, and abrogating what is bad to heat our boilers and drive our engines? Or, to come more nearly to the pounds, shillings, and pence aspect, how many among us buy our lime in terms of CaO, and pay on the composition of each sample? or buy our coal on the basis of pounds of sperm, and see that we get what we pay for? or see that our waste lime deserves the appellation of "spent," and does not consist of half unused hydrate?

These are but one or two among the many questions to be dealt with, if the potentialities of gas manufacture are to be fully opened up.

Whether the science of modern chemistry owes its inception to Cavendish or Lavoisier will perhaps ever remain a debateable point. There is none as to the origin of our own great industry. And since it is to our countryman William Murdoch, that all the honour of this is due, should not our persistent efforts be directed to maintaining that unquestioned supremacy? The result can only be obtained by every one of us, each in his own sphere, working steadily onward with the great goal in view; and that this Association may win its share of the laurels is the hope which inspires our efforts to make even greater the proud position it holds to-day.

Mr. C. E. Botley (Hastings), in proposing a vote of thanks to the President for his admirable address, said it was not usual to criticize or make any remarks thereon, but he desired to say that they all concurred in the sympathetic reference he had made to their Past-President, the late Mr. Somerville. The address proved that there was much a President could write about, in spite of the numerous meetings that were held in connection with the profession.

Mr. W. D. Child (Romford) seconded the proposition, which was unanimously agreed to.

The President said he was much obliged and grateful to the members for the hearty manner in which they had received the delivery of his address. He was quite cognizant of this fact: that he had said those things he ought not to have said, and had left unsaid those things which he ought to have said. They must, however, take him in good faith; and if there were parts to which exception could be taken, they must remember that the President, like the King, could do no wrong. (Laughter.)

Presentation to Mr. Helps.

The President said it was now his rare good fortune to have to perform the most pleasing duty that it was probable would ever fall to his lot, and certainly the most pleasing duty that could ever fall to the lot of any President of the Southern District Association. Presidents came and Presidents went, but the Secretary stopped with them (he was about to say) for ever. At any rate whether or not that was so, he undoubtedly was the mainspring which kept the Association going in the manner it did; and by a similar analogy, they might look upon the President for the year as being the key which for that period wound him up. The presentation he was about to make to Mr. Helps he was quite aware was not the highest it had been his lot to receive. He had probably had in the past other testimonials of his excellent qualities which he might be pardoned for valuing more than the one he (the President) was going to hand to him; and yet he thought he could truthfully say that no presentation could be given with more heart—he thought he could almost add, with more love—from a body of men to another than this he was going to make to Mr. Helps. It had taken the form of a handsome gold chronometer; and the inscription on it was as follows: "Presented to Mr. J. W. Helps, by the Southern District Association of Gas Engineers and Managers, in grateful recognition of his services as Honorary Secretary—February, 1893." Handing the watch to Mr. Helps, the President said: I have great pleasure, on the part of the members of this Association, in presenting you with this watch, which is but a poor recognition of the value in which they hold your services as Secretary.

Mr. Helps, in acknowledging the gift, said, as no doubt most of the members could imagine, his position at that moment was a very trying one. He had been present on similar occasions; and he noticed that the recipient generally began his speech by saying that he never was more surprised in his life than he was then. He, however, could scarcely commence his remarks in that way; but when, about a week previously, he had a letter from his old friend Mr. Chapman, urging an immediate appointment with him in town, and was informed that the members of the Southern District Association intended making him a present, then he was surprised. He was surprised because he felt that, for many reasons such a testimonial was not deserved, seeing the short time (only about six years) he had acted as Secretary; and the light—he might say pleasurable—nature of the duties he had to perform did not appear to him to warrant any such recognition at the hands of the members. But he could sincerely say that he most thoroughly appreciated the manner in which, whatever his services had been, the members had recognized them. He had scarcely had the opportunity of examining the watch; but he knew it was a splendid one, and would do what his present old watch would not do, and that was keep time. At that moment, his pleasure was somewhat mingled with sorrow, as it was just thirty years ago that his father presented him with the silver watch he was then wearing, and had worn ever since. And why he felt it was because the watch represented the fruits of his father's first earnings; and he should always value it for that. In presenting him with a watch, the members were giving something to his family; and it would always form an heirloom. The President had said that he had probably received in his life testimonials which he valued more than the present one; but in saying this, he had said something which he (Mr. Helps) did not feel was true. He had never had anything given to him which, he was sure, he should always look upon with so much pride, and which would bring back to him such pleasurable memories, as the watch he had received that day, and for which he thanked the members one and all most heartily.

This concluded the business portion of the proceedings; and the members shortly afterwards dined together.

REGISTER OF PATENTS.

Starting and Ignition Apparatus for Gas-Engines.—Crossley, F. W., and Bradley, H. W., of Manchester. No. 2862; Feb. 13, 1892.

According to this invention, a hand-pump (preferably double acting) is used, with suction-valves at each end drawing in air as the piston is moved to and fro. The inlet-port for gas is at the middle of the pump; so that, when the piston passes this port, gas flows in and mixes with the air already drawn in—the proportion of the mixture being determined by the relation which the first part of the stroke, made before the piston passes the gas-port, bears to the last part afterwards performed, during which mostly gas enters the pump. The mixture is forced through discharge-valves into the engine cylinder, past a shut-off valve, which is opened while the pump is worked, but is closed during the ordinary working of the engine. Into the box of the valve, there is an opening provided with a lightly hung flap-valve, which can be pushed open inwards by pressing on its externally projecting stem. The main piston being somewhat advanced in its outstroke, the space in the cylinder behind it is charged by working the pump with combustible mixture. The valve is then opened, and a light is applied which ignites the charge; and the piston is thus propelled with sufficient force to cause such movement of the engine that a succeeding charge is drawn into the cylinder, and fired in the usual way. While the cylinder is being charged by the pump, the ordinary air-supply valve may be opened, to allow the passage of combustible mixture from the cylinder into the pipe or chamber connected with the air-valve; or the pump may directly supply this pipe or chamber with combustible mixture, so that, on the first suction stroke of the engine, when it has been started, a charge shall be drawn into the cylinder more certainly explosive (say the patentees) than that which sometimes is obtained by drawing from the gas-main in the usual way.

In starting engines which act on the "Otto" cycle, it is usual to relieve more or less the back-pressure on the piston during its compressing stroke, by opening the exhaust-valve during part of that stroke; a certain amount of the combustible charge being thus wasted. Instead of effecting relief by thus opening the exhaust-valve, the admission or charging valve may be held open for a time, so that the combustible mixture passing from the cylinder is retained in the valve chamber and passages, ready to form part of the next charge drawn in. For this purpose, the cam which acts on the roller of the admission-valve lever is made with two steps—the lower for use in the ordinary working of the engine, and another with an increased "dwell" to be employed, during several strokes at starting, to hold the admission-valve open, not only during the suction stroke, but also during part of the compressing stroke.

For starting twin or multiple cylinder engines, the pump is employed for charging each of the cylinders and their supply chambers and passages; the engine being in such a position that one of the pistons is about midway in what would be its working stroke. The ignition of the charge in one of the cylinders is then effected as described; and after the engine is started, it goes on in the usual way.

Automatic Sale and Delivery of Gas.—Gow, J., of Stoke Newington, and the Gas-Meter Company, Limited, of 238, Kingsland Road. No. 13,037; July 15, 1892.

This invention in coin-freed apparatus for the automatic sale and delivery of gas, consists essentially in so constructing the gas-inlet valve, and connecting it and the drum, or other measuring part of the meter, to the coin-freed mechanism, that the insertion of coins opens the valve, and allows the drum or its equivalent to act until a quantity of gas of equal value to the coins inserted has been delivered.

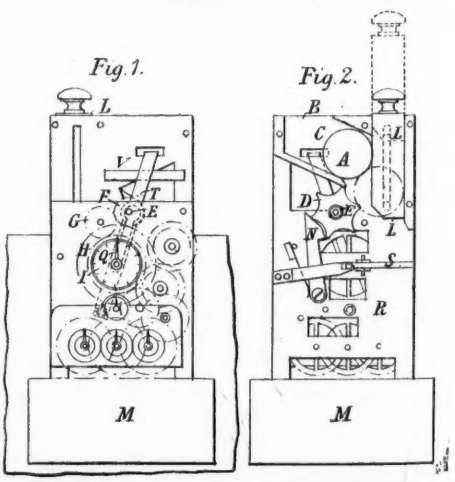


Fig. 1 is a front elevation of one arrangement of coin-controlling and indicating mechanism, as applied to an ordinary dry gas-meter; the outer casing being removed. Fig. 2 is a back elevation of the same; the back plate of the coin-shoot being removed, in order to show the passage of the coin through the apparatus. Fig. 3 is a side elevation; some of the parts being removed. Fig. 4 is a horizontal section at the main arbor.

Fig. 4.

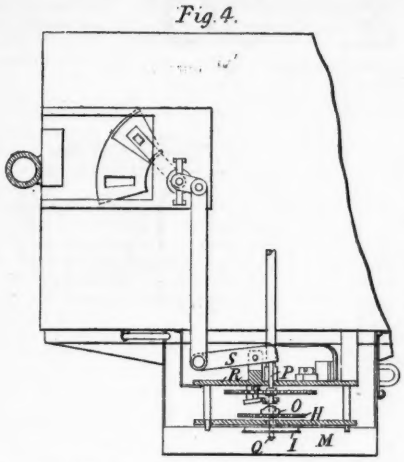
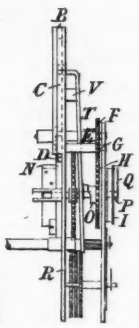


Fig. 3.



A coin A (fig. 2) is inserted in a slot B, and, passing down a shoot C, engages with a star or lobe wheel D, mounted on an arbor E, on which is also mounted a pinion F (fig. 1), gearing through the pinion G, with a spur-wheel H, secured to, or forming part of, an indicating-dial I, on which the value of the gas to the credit of the consumer is indicated. In the shoot is a plunger L, which, on being raised, allows the coin to pass it and fall between two adjacent teeth or lobes of the star-wheel; so that, on again depressing the plunger, the coin is forced through the shoot and falls into a receptacle M, and in its passage rotates the star-wheel through one division—causing the indicating-dial, by means of the tooth gearing wheels F G H, to also rotate through a corresponding unit division. A spring pawl or cam N engaging with the star-wheel causes it to always occupy a determinate position after the passage of a coin, ready for a succeeding operation. A cam O (figs. 3 and 4), secured to, or forming part of, the indicating-dial and its spur-wheel is loosely mounted on an arbor P, having a limited longitudinal movement, and carrying on one end a pointer Q, working over the face of the indicating-dial; while its remote end projects through its bearing in the plate R, and engages with a lever S connected to the gas-inlet valve, so that, on sliding the arbor longitudinally forwards or backwards, the gas inlet-valve is closed or opened—the said lever being kept pressed against the end of the arbor by a spring. On the arbor P, which constitutes the main or central arbor of the controlling mechanism, is rigidly mounted a spur-wheel, connected through pinions and the ordinary mechanism with the measuring device of the meter; so that, on the passage of gas through the meter, the sliding arbor is rotated by it. On the main arbor is a projection or tooth, which engages in an inclined recess in the cam on the spur-wheel of the indicating-dial; so that, when the arbor and dial are rotated relatively to one another in one direction, they are drawn out of engagement, while when rotated in the opposite direction, they fall into engagement.

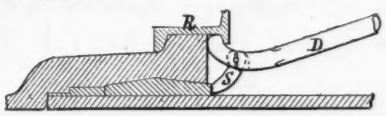
In the event of the maximum prepaid amount of coin for which the apparatus is arranged (ten pennies in the apparatus shown) being passed through the coin-shoot before any of the equivalent gas is consumed, the passage of further coin is prevented, until the unit quantity of gas has been delivered, by means of a stop-lever T. So long as any number of coins less than ten pennies have been passed through and stand to the credit of the purchaser, the stop is held in its normal position out of the path of the coin by the spring V; but on the passage of the tenth coin, the projection slides up the incline on the cam and displaces the lever T, pressing the end across the coin-shoot, and thus preventing the passage of a further coin until, by the consumption of a sufficient quantity of gas, the arbor is rotated sufficiently for the projection to again slide down the incline and permit the lever to resume its normal position.

The mode of operation of the apparatus is as follows: The inlet gas-valve being closed, and the meter-drum or its equivalent being quiescent, and the tooth or projection on the main arbor being in its initial position—that is, in the inclined recess of the cam O—a suitable coin is inserted in the slot, and passes down the coin-shoot C, the raising of the coin plunger L allowing it to fall into an operative position between two adjacent teeth or lobes of the star-wheel. The subsequent descent of the plunger forces the coin out of the shoot into the coin receptacle, and rotates the star-wheel through one division; the indicating-dial being by this means also rotated through one division. This rotary movement causes the projecting tooth on the main arbor to slide up the inclined recess on the cam O, which slides the main arbor longitudinally on its axis, and operates to open the gas inlet-valve, thereby admitting gas to the meter. The displacement of the projecting tooth, at the same time releases the drum or its equivalent, so that it is free to operate until the tooth, by the rotation of the connecting gearing and main arbor, again falls into engagement with the recess in the cam. The indicating-dial is divided into ten parts—each division representing the angle traversed by it on the passage of a coin; and as several coins may be passed through the apparatus successively, the position of the index-pointer on the indicating-dial indicates the value and quantity of gas to the credit of the purchaser.

The relative angular motion of the coin star-wheel and indicating-dial being constant, the quantity of gas supplied per unit coin may be varied by suitably proportioning the gearing connecting the main arbor to the meter-drum, or its equivalent. For this purpose, the two connecting pinions are made changeable, so that they may be removed and replaced by others to give the requisite velocity-ratio.

Pipe-Joints.—Daehr, W., of Berlin. No. 13,495; July 23, 1892.

The leading idea for the construction of this apparatus, says the patentee, has been "to render useful the power of the human arm (not sufficing alone) by the help of a lever for the production of a better calking of pipe-joints."



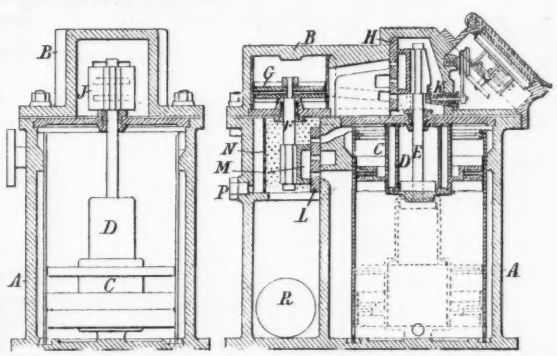
The apparatus is differently constructed for iron-pipes and for clay-pipes for different calking materials. In the former case, it consists of a press-lever D and a stamp S. The lever opposes with one of its ends against a wrought-iron ring R, put round the socket and drawn together by two screws; while the stamp S, resting with its upper flat end against the lever, presses with its foot against the lead-ring for calking. A pressure upon the long lever-arm, presses the stamp S against the lead-ring. By rotating the stamp round the pipe, the compression of the calking material is effected throughout the circuit.

Carburetting Gas and Air.—Wells, A. W.; communicated from F Verrue, of Brussels. No. 19,438; Oct. 29, 1892.

This invention relates to apparatus for enriching gas and for carburetting air, formed of three concentric chambers, separated from one another by partitions soldered at the top to the cover of the carburetter, and resting at bottom upon layers of cloth, which respectively cover the bottom of the outer chamber and the raised platform constituting the bottom of the two inner chambers. The three chambers are arranged so that the gas or air first enters the outer chamber, which is fed with oil from a suitable reservoir, and in which the gas or air is charged with carbon in circulating all round the chamber. From this the gas or air passes into the second chamber, around which it circulates; and in which it is "stripped" of the excess or part of the excess of carbon which it contains. The gas or air then passes into the central chamber, through groups of flattened tubes, so arranged that in each group the jets of gas issuing from the tubes impinge upon each other, in order to "render complete and fixed the union of the carbon with the gas or air entering the central chamber, where all excess of carbon which the gas or air may still contain is chilled out of it before it passes to the burners." In each of the three chambers of the carburetter, perforated cylinders are placed close or nearly close together. Each rests upon cloth covering the bottom of the chambers, and is of such height as to be in contact with the top thereof. The cylinders in the outer chamber are filled with an absorbent material (such as porous wood fibre); those in the middle chamber, with a suitable "stripping" material (such as asbestos); and those in the central chamber, with a bad conductor of heat (such as charcoal).

Liquid Meters.—Matthieu, E., of Paris. No. 21,568; Nov. 25, 1892.

This invention relates to that class of meters in which the liquid is measured by a double set of pumps and distribution-valves, as shown in the accompanying illustration—a longitudinal vertical section and a cross section of the meter.



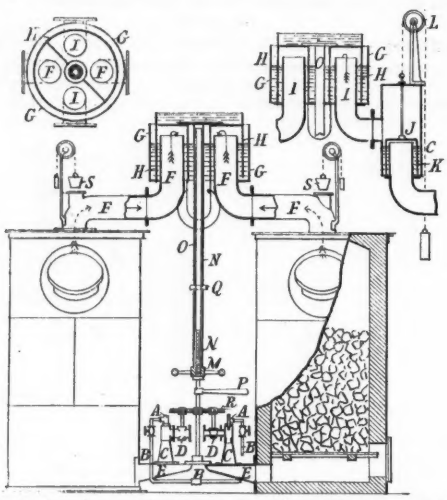
The entire mechanism of the meter is contained within a casing formed of two parts, each holding a pump-barrel, piston, and slide-valve. The part A also contains a strainer and air-cushion, for preventing shocks; while B contains the counting train, to register the quantity of liquid passing through the meter. One pump-barrel is a copper cylinder fixed to the casting A by lead packings at its upper and lower ends, so as to avoid fitting. It is perforated at its lower end; and the space between it and the casing A puts a port in communication with the underside of the piston, and (being of great area) admits of a free and slow circulation of the liquid. The second pump-barrel is also a fixed copper cylinder, provided with apertures at its upper and lower ends respectively, in communication with the ports of the meter. The main piston is constructed of a cylindrical body C in one with the piston proper, which has a double-cupped leather, and with a guide-ring, which works freely in the first-named cylinder. The body is closed at its lower end; and within it is fitted a telescopically sliding extension D, which has an outward flange at the bottom, engaging the flange at the top of the body C, and an inward flange at the top, which is engaged by the head of the rod E of a slide-valve J. The piston G is of the ordinary kind, provided with cup leathers; and to its rod F is attached a slide-valve M. The pump-barrels are closed by covers, provided with stuffing-boxes for the rods E F, either packed with U-shaped cup leathers or of L form, so that the joint may be made by the pressure of the liquid and not by the gland Q. In either case, the friction of the packings is proportionate to the pressure of the liquid, so that the meter will work at the lowest pressures. The seat H of the main slide-valve is a ported plate, whose edges are sealed with lead in the casing B; and the ports connect with the circulation channels in the cover B. The D-valve J is of such length as will ensure a minimum stroke—sufficient to enable the double-armed lever K to advance (to the extent of one tooth) the ratchet-wheel which actuates the dial-train. The lower end of the valve may have

a lap on the inside, as shown in dotted lines, in order to prevent communication of the ports at mid-stroke. The seat L of the other slide-valve consists also of a ported plate sealed in place by means of lead, and of the valve M, which is of the ordinary short D-form, instead of elongated like the valve J. The lever K, through which the dial-train is operated, is engaged in a notch in the lug on the back of the valve J, into which notch the lever is sprung by sliding upon the inclined edge of the lug. The valves J and M are held to their seats by small hollow rubber cushions, inserted between the backs of the valves and the rods E F. P is a removable plug, for enabling the strainer N to be washed when clogged.

The action of the meter is as follows: The liquid, on entering filters through the perforated diaphragm N, fills the two slide-valve chambers which are connected by the passage, and also fills the chamber containing an elastic cushion R, such as an inflated rubber ball, for preventing shocks. Supposing the parts to be in the position indicated in full lines, the water will pass into the upper end of the pump-barrel, and move the main piston downward, thereby expelling the measured quantity of water contained beneath it. When the telescopic body portion C D is extended to the full extent, the slide-valve J will (by the further motion of the piston) be moved to the position shown in dotted lines, so as to uncover the upper port, and allow the water under pressure to pass to the underside of the piston G, and move it upwards, so as to uncover the lower port of the slide-valve L. The main piston being now at the bottom of its stroke, the water will pass to its underside; and the measured quantity of water contained above the piston will be forced out. On the upward stroke of the main piston, the parts C D are first collapsed; and then the valve J is returned to its original position, again admitting water under pressure to the upper side of the piston G, which is forced down so as to expel the measured quantity of water contained beneath it. The parts being now returned to the initial position, the double movement of the pistons is repeated as before, and so on.

Manufacture of Illuminating and Heating Gas.—Fourness, H., of Liverpool. No. 21,871; Nov. 30, 1892.

This invention deals to a large extent with improvements on patent No. 15,469 of 1891, which related to the manufacture of illuminating and heating gas composed of water gas and oil gas; the carburetted gas being evolved in a producer, and then passed to closed retorts, and therein fixed—a further enriching supply of oil being sometimes fed into the retorts. The present invention refers to the construction of shunting and diverting and stop valves, and the arrangements of mechanism for automatically cutting off and admitting air to the producers.



The illustration is an elevation (partly in section) of a pair of gas producers, having above and between them such a water-valve or hot-current shunting arrangement. There are also a horizontal section of the water-valve, and a vertical section showing the outlet to the retorts from the water-valve, and the sealed valve in connection therewith, for preventing any back flash from the retorts while the water-valve is being operated.

The producers are of the ordinary construction—cylindrical casings of metal, lined with fire-brick or refractory material. The air is forced in at the foot of the producers by steam-jets A, supplied through a pipe B. The steam-jets blow into hollow stands C; and air is drawn in through valves D. The air is forced through the hollow feet E into the producers, and beneath the coke, which is thus raised to a state of incandescence. While this blowing up is going on in one producer, the products of combustion escape through the pipe F to a water-sealed diverting-valve. This valve consists of a cylindrical vessel or tub G (with a hole in the centre), composed of a cylindrical wall rising to the same height as the top of the cylinder. The two pipes F, and also the pipes I, project upwards through the bottom of the vessel G, and support it by means of flanges projecting from the pipes. Next there is an inverted annular bell or vessel H, the annular space of which contains the upward projecting pipes F. The vessel H has a water-tray at the top. A partition extends across it, dividing the pipes from one another. The vessel is filled with water to the indicated level—the water thus surrounding the four pipes. The tray at the top of the bell H is also filled with water. The parts comprising the valve are thus kept cool and unaffected by the hot currents.

In connection with the pipe leading to the interior of the retorts, is placed a water-valve, which consists of a vessel J into which the branch discharges. Another pipe projects upward from the bottom of the vessel, and is surrounded by water as shown. An inverted bell or vessel K is placed over this pipe, and is attached to, and worked by, a packed rod and chain passing over the pulley L, so that, when desired, the bell can be raised to allow free passage of the gas through the vessel to the retorts.

According to the position of the parts shown in the main central illustration, the coke in the producer is being fired up; the products of combustion being led through the pipe F into the partitioned-off chamber of the annular space. So long, therefore, as the bell H remains as in the top left-hand view, the products of combustion will pass into the pipe I, and so to the smoke stack or to the retort-furnace. When the coke in the producer has been made incandescent, and is in a fit state to produce water gas, the current is shunted by first of all lowering the bell K of the valve to the position shown in the right-hand top view, so as to cut off communication with the retorts. The loose hand-wheel M is then turned, the boss of which constitutes a nut on the screwed portion of the upright shaft N. This shaft is surrounded by a sleeve O projecting downward from the bell, and secured to the tray by a flange, as shown. By turning the hand-wheel nut M, the sleeve O is raised and the bell H lifted until the lower edge of the partition clears the top of the pipes F.I. The handle P is turned to give the upright shaft N a quarter of a turn. The cottar Q, projecting from the shaft N through slots in the sleeve, compels the sleeve to partake of the motion of the shaft, and so turns the bell H through a quarter of a turn. The shaft N is connected by gearing R to the plugs of the air-valves D, so that the same motion of the shaft N shuts the air-valves D leading to one producer, and opens the air-valves leading to the other one. The bell H is now quickly lowered, thereby connecting the pipes as required. The bell of the valve is also raised; and as the steam continues to blow into the foot of one producer and to rise through the incandescent coke, the manufacture of water gas commences. At the same time, oil is admitted to the upper part of the producer, so as to carburet the water gas. The mixture then passes along the pipe F into the fixing retorts. In the meantime, the same operations which have had the results indicated with regard to the one producer, have also opened the air-valves of the other producer; so that, whether the coke in the latter producer is fresh, or has become dulled down by the admission of steam alone, it is again blown into incandescence by the admission of air.

APPLICATIONS FOR LETTERS PATENT.

2050.—Kerr, J. H., "Gaslight apparatus." Jan. 30.

2086.—Gordon, J. E. H., "Oil and gas engines." Jan. 31.

2110.—Dixon, C. W., "Gas-engines." Jan. 31.

2183.—Purcell, J., and Carnaby, S., "Gas-pressure indicators and regulators." Feb. 1.

2192.—Heussy, A., "Regenerative gas-lamps." A communication from L. Fremaux. Feb. 1.

2212.—Meldrum, J. J. and T. F., "'Destructor' and other furnaces." Feb. 1.

2216.—Steele, J., and Brierley, J. W., "Mechanism for automatically delivering a supply of gas in exchange for a coin of fixed value." Feb. 1.

2247.—Stanley, J. C. W., "Manufacture of block fuel, gas, and other useful products, from refuse materials." Feb. 1.

2376.—Harrison, C. H., "Gas-oil light." Feb. 3.

2391.—Brooks, J., and Sleightholme, T., "Gas or lamp chandeliers, pendants, and brackets." Feb. 3.

Gas Exhibits at Bingley.—Yesterday week an exhibition of the gas appliances manufactured by Messrs. C. Wilson and Sons, of Leeds, was opened at Bingley by the Chairman of the Improvement Commissioners (Mr. G. H. Aked). It was well patronized throughout the week, as were also a course of lectures on the use of gas-stoves for cooking, given by Miss Smith, of the Yorkshire School of Cookery

The Consumption of Gas at Heywood.—The Gas Committee reported to the Heywood Town Council last Thursday that, during the last quarter of 1892, there was a net decrease in the consumption of gas, as compared with the corresponding period of the previous year, of 10,193 cubic feet. In dwellings and shops there had been an increase of 1,062,744 feet; but the consumption in mills showed a decrease of 2,223,400 feet, owing to the unfortunate stoppage. With regard to the public lamps, there had been an increased consumption of upwards of 700,000 feet; and there was an increase in the quantity used in stoves and for motive power.

The Death by Drowning of the Middlewich Gas Manager.—The inquiry into the circumstances attending the death of Mr. Peter Hancock, Manager of the Middlewich Gas-Works, recorded in the Journal last week (p. 220), was held on the 3rd inst. by Mr. H. C. Yates. It may be remembered that the body of the deceased was found in the North Staffordshire Canal on the previous Wednesday morning. The evidence adduced went to show that Mr. Hancock visited the gas-works soon after midnight, and left them in his usual spirits at a quarter to two; and he was not again seen alive. As there was no suspicion of suicidal tendency, or any mark upon the body to indicate foul play, the unhappy circumstance was, the Coroner thought, attributable to accident. He advised, however, the return of a verdict of "Found drowned;" and the jury agreed to this. In the course of the proceedings, the Secretary of the Middlewich Gas Company (Mr. T. Hulme) contradicted, in a most emphatic manner, a report which had been spread that Mr. Hancock's accounts were incorrect, that he was under notice to leave the Company, and that the fact had preyed upon his mind. There was not, he said, the slightest foundation for any such report, as Mr. Hancock had settled up all his accounts to the last penny on the Monday before his death. This statement was supported by Mr. Royle, the Managing-Director of the Company. The funeral took place on the 4th inst.; and it was attended by a large number of private and professional friends of the deceased. The late Mr. Hancock was formerly a member of the Samaritan Lodge of Freemasons at Sandbach; but on the formation of the Avondale Lodge at Middlewich, of which he was one of the founders, he joined it, and at the time of his death held the office of Senior Warden.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

The Investment of Reserve Funds.

SIR,—I am much obliged to Messrs. Ellis and Livesey for their replies, published in your issue of the 31st ult., to my questions on the above subject.

Certainly, directors are not responsible for the fluctuations of stocks and shares; but my case was that of a company whose reserve fund was full to the maximum allowed to them—viz., £5000 (being one-tenth of their nominal capital)—and the whole of it was invested. The stock in which the fund was invested had increased in value so considerably as to cause the directors to consider the advisability of changing the medium thereof. Presuming the £5000 in question was originally invested to realize an annual income of (say) £165, or £3 6s. per cent., the stock was a good one, and the price of it advances to such an extent as to make the supposed investment worth £5500, the latter amount is the one now practically earning the £165, or an equivalent of only 3 per cent.

I take it that Government or other securities "are those in which trustees are legally entitled to invest;" and there are some few which yield up to about 3½ per cent. Would it not, then, be a wise thing to do, especially in the case of a comparatively small concern, to sell out of the former at the increased value, and re-invest in the latter, and that without involving the Directors in a charge of "speculation"? If the sale and re-investment occur, do I interpret both your correspondents correctly, in supposing that the £500 must again figure separately in the accounts, and that the premium of £500 would appear in the same account by itself? Also that it would be the proper thing to add, year by year, the increased income of (say) £14 to that premium account, and not to bring it along with the original income to the profit and loss account? Again, if I am correct so far, presuming the £5500 be thus re-invested, and in course of time circumstances happen by which the Directors require some portion of the fund—say, to make up a dividend—could the premium be used for the purpose, and then be replaced out of future profits?

While apologizing for thus trespassing upon your space, I consider the points raised to be of great interest; and I am also of opinion that they are in many instances very imperfectly understood, and are therefore worthy of discussion.

Feb. 9, 1893. A SECRETARY.

The Recovery of Bye-Products from Coke-Ovens.

SIR,—Mr. A. L. Steavenson, in your issue for the 24th ult., commences his letter on the above subject with the homely adage of "You cannot eat your cake and have it." I do not quite see its application to the question with which he deals; but, in replying to his letter, I may justly and appropriately quote another domestic proverb—viz., "The proof of the pudding is in the eating." This is not the first time Mr. Steavenson has expressed his bias against "close oven coke," although I am not aware that he has ever had any great personal experience of its manufacture, or its use on a considerable scale.

It is only fair to Mr. Henry Simon, of Manchester, who introduced the Simon-Carvès ovens into this country, and who, it will be seen later on, thereby did a great service to the iron industry, that the following facts should be known: (1) Coke made in similar ovens to the Simon-Carvès ovens is almost universally used in Silesia, Westphalia, to a large extent in France, Belgium, Spain (in the latter country with Durham coals), Austria, and other countries; and in each district the number of ovens is increasing enormously. (2.) Messrs. Pease and Partners, of Darlington, were the first English coke makers to put down an installation of these ovens, in the year 1881. Since then, so successful have they proved, that they have four times increased the number they commenced with. (3) The Bearpark Coal and Coke Company, Durham, Messrs. Macalpine, Altham Collieries, Whinney Hill, Accrington, Messrs. Wedgewood, Bignall Hill Colliery, Newcastle, Staffordshire, the Micklefield Coal and Lime Company, near Leeds, have each a number of Simon-Carvès ovens working most satisfactorily, and disposing, without any difficulty, of the coke and the bye-products they produce. (4) We are at present building 70 ovens on these lines at Lanchester, near Durham; and Mr. Simon and M. Carvès, together with Colonel Sadler, own almost the entire share capital.

This does not look like want of confidence; and, notwithstanding the prejudice of so-called "practical" men, there is not a shadow of doubt that this class of coke will be the fuel of the future for iron-smelting, for the simple reason that it will be the cheapest, as it has been conclusively proved to be on the Continent and elsewhere. Notwithstanding all statements to the contrary, this fact remains: Continental iron makers use less of this coke per ton of iron made than do English iron makers of their beloved beehive coke. As I can substantiate this statement, it is not necessary for me to make any reference to the density, porosity, or superficial appearance of our coke, concerning which Mr. Steavenson has so much to say. Surely, it is not all a question whether a certain coke is the most perfect coke imaginable in every respect, but whether a coke possibly not entirely corresponding to this ideal coke comes in so much cheaper that the advantages of its use vastly overbalance any possibly small and imaginary drawback.

Lanchester, near Durham,
Feb. 9, 1893.

W. SCHROLLER, M.I.Mech.E.,
Resident Engineer, Durham Coke and Bye-Products Company, Ltd.

Sales of Shares.—At Norwich, a few days ago, ten shares in the *Norwich Water-Works Company* realized from £19 to £19 6s.; and six additional shares in the *Lowestoft Water, Gas, and Market Company* made an average price of £16 6s.——At a sale of miscellaneous shares at Camborne last Wednesday, about 60 £5 shares in the *Camborne Gas Company* realized prices varying from 4s. to 5s. above par; and 20 shares in the *Camborne Water Company* obtained buyers at £22 and £22 2s. 6d.——The *Lynton Water Company* last week disposed of £2500 of debentures, carrying interest at 4 per cent. The total sum realized was £2751 15s.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills presented and read the first time: Belfast Water Bill; Bilston Commissioners Water Bill; Chatham Corporation Water Bill; Dublin Corporation Bill; Frimley and Farnborough District Water Bill; Pontypridd Local Board Gas Bill; Rathmines and Rathgar Water and Improvement Bill; Rochester Extension and Water Bill; Runcorn Water Bill; Sheffield Corporation Water Bill; Stockton-on-Tees Corporation Gas Bill; Todmorden Local Board Gas Purchase Bill; Weaver Navigation Bill.

Bills presented, read the first time, and referred to the Examiners: Accrington Gas and Water Bill; Crystal Palace District Gas Bill; Imperial Continental Gas Association Bill; New Swindon Gas Bill; Staines and Egham District Gas Bill; Wolverhampton Gas Bill.

The Ilkley Local Board Bill and the London County Council (Subways) Bill were brought from the Commons [see below] and read the first time; the latter being read a second time and committed.

HOUSE OF COMMONS.

Monday, Feb. 6.

SUSPENDED BILLS OF LAST SESSION.

The following progress was made with Bills which had not passed through all their stages at the prorogation of Parliament last year: Blackpool Improvement Bill and Leeds Corporation Bill read the first and the second time, and committed; Ilkley Local Board Bill and London County Council (Subways) Bill read the first and the second time, and, having been reported and considered in Session 1892, ordered to be read the third time.

BILLS INTRODUCED.

The petitions were presented for the following Bills, which were ordered to be brought in:—

Aberdeen Corporation Bill, by Mr. Bryce and Mr. Hunter.
*Altrincham Gas Bill, by Mr. Sidebotham and Mr. Disraeli.
Barnoldswick Local Board Bill, by Mr. Oldroyd and Mr. Roundell.
Barry and Cadoxton Local Board Bill, by Mr. A. Williams and Mr. Davies.
* Bodmin Water Bill, by Mr. Courtney and Mr. Owen.
* Brighton and Hove Gas Bill, by Sir W. Marriott and Sir H. Fletcher.
* Brighton Electric Lighting Bill, by Sir Seymour King and Mr. Beaufoy.
* Devonport Water Bill, by Mr. E. J. C. Morton and Mr. Kearley.
* East London Water Bill, by Mr. Boord, Sir J. Savory, Mr. Banbury, and Mr. Penn.
East Stonehouse Water Bill, by Mr. E. J. C. Morton and Mr. Kearley.
* Goole and District Gas and Water Bill, by Sir F. Milner and Mr. Beckett.
Greenock Corporation Bill, by Sir T. Sutherland and Mr. S. Williamson.
Liverpool Corporation Bill, by Baron Henry de Worms, Mr. Neville, and Mr. Willox.
London County Council (General Powers) Bill, by Sir J. Lubbock, Mr. J. Stuart, and Mr. Benn.
Plymouth Corporation Water Bill, by Sir E. Clarke, Sir W. Pearce, and Mr. Luttrell.
*South Staffordshire Water Bill, by Mr. Brooke Robinson and Mr. Hingley.
St. Helen's Corporation Bill, by Mr. Seton-Carr and Mr. Willox.
Stirling Water Bill, by Mr. Campbell-Bannerman and Mr. Jacks.
West Hampshire Water Bill, by Mr. Beach and Major Rasch.

On Tuesday and Wednesday all the above Bills were presented and read the first time; those marked * being referred to the Examiners, and the remainder being ordered for second reading.

Thursday, Feb. 9.

The Ilkley Local Board Bill and the London County Council (Subways) Bill were read the third time and passed.

A petition against the East London Water Bill was presented from the Woodford Local Board.

Friday, Feb. 10.

A report was presented from one of the Examiners that the Standing Orders had not been complied with in the case of the Staines, Chertsey, and Districts Sewage Bill; and it was referred to the Standing Orders Committee.

A petition against the East London Water Bill was presented from the Wanstead Local Board.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, Feb. 8.

(*Before Justices* LAWRANCE *and* COLLINS.)

Finchley Local Board v. Barnet District Gas and Water Company.

Two appeals, on behalf of the plaintiffs, from the decision of the Magistrates at the Highgate Petty Sessions, were heard to-day. In the first, the question was whether the defendants were bound to keep a constant supply of water in their mains under pressure; in the second, whether they were bound to keep in their mains a constant supply of water for extinguishing fires. The proceedings before the Magistrates were reported in the JOURNAL for Oct. 11 last (p. 641).

Mr. CHANNELL, Q.C. (with him Mr. A. MACMORRAN), who appeared for the plaintiffs, said the question in both the cases was how far certain sections of the Water-Works Clauses Act, 1847, were inconsistent with the defendant Company's Special Act of 1883. The plaintiffs had proceeded against the defendants for two breaches of their duty under the Act of 1847; and these breaches were clear, if the Act stood unaffected. But it was suggested that there were matters in the Special Act which were contradictory to the Act of 1847, and that they were therefore set aside. The Company was incorporated, by an Act passed in 1872, for the purpose of supplying Finchley with water; and, by section 2, the Water-Works Clauses Acts, 1847 and 1863, were incorporated therewith. It was provided by the Company's Act of 1872 that water need not be constantly laid on under pressure. In October, 1892, the plaintiffs laid an information that, in August of that year, the defendants had not provided, in a certain street, a sufficient supply of water for the purpose of cleansing sewers and drains. It was proved that the pipe referred to was one to which fire-plugs had hitherto been affixed; that it was not a trunk main, but a service main; and that the Company did not keep the service mains charged with water under pressure during the whole 24 hours. On the day in question, the appellant's servants went to a plug affixed to a standpost on the pipe, to draw water to flush the sewers and water the streets; and, upon opening the valve, no water flowed, as it had been turned off at the trunk mains. If there was any water in the service main, it was only "dead" water—not water under pressure. The stand-post was more than 300 feet above Ordnance datum level. For the defence it was urged that, the pipe being above this level, the Company were not bound to provide a constant supply; and the Magistrates decided this point in their favour. He (Mr. Channell) contended that, for the purpose of domestic supply, the defendants were not under an obligation, until certain conditions had been complied with, to have a defined pressure, which under other circumstances they would be bound to have. The point was whether this relieved them from the public provisions in the Act of 1847, which obliged them to have for public purposes a sufficient supply of water. If the plaintiffs had a certain quantity, they could arrange to pump it by means of fire-engines; and consequently this would suffice for their purpose. All they wanted was for water to be in the pipes, although they did not require it under such pressure as would send it to the tops of the houses. He contended that the true construction of the Act was this: That, although the defendants were relieved from the obligation to put a defined amount of pressure upon the water to send it to certain levels, they were not relieved of the necessity of giving a constant supply for the purpose of flushing sewers.

Mr. FINLAY, Q.C. (with him Mr. BESLEY) said the short answer to the case would be found in the word "constantly" in section 37 of the General Act. This section did not create any penalty. In order to hit the Company, it was necessary to bring them within section 43, which provided that, if the Company failed to give a sufficient supply of water for public purposes upon such terms as had been agreed upon, or if they neglected to keep their pipes under pressure, or refused to furnish a supply of water, they should be liable to a penalty of £10. The case stated by the Magistrates recited that the Local Board had caused an information to be laid that, on the 26th of August last, the Company had failed or neglected to "provide and keep constantly laid on and keep charged in the water-pipe situated in the East End Road, Finchley, to which said pipe fire-plugs were affixed, a sufficient supply of water for cleansing the sewers." The proceedings having been taken under the wrong section, the summons was bad upon the face of it; and, upon the facts stated, it was impossible to say that an offence had been committed. It could not be declared that they had "neglected or refused" to supply the Local Board with water for public purposes. That was not the charge. The complaint was that there was an absence of pressure. But the pipes were full of water; and there was plenty to fill the water-carts, if it had been pumped.

Justice LAWRANCE: You say no evidence has been given of absence of water in the pipes?

Mr. FINLAY: Quite so. The fact is, the plaintiffs wish, without complying with the provisions of the Special Act, to get a supply of water under pressure. The point has already been decided by the case of *Purnell v. Wolverhampton New Water-Works Company*.*

Justice LAWRANCE said the question for the decision of the Court was whether the 53rd section of the Special Act of 1872 relieved the Company from the liabilities which they were *prima facie* under in regard to sections 35, 37, and 42 of the General Act of 1847. He could not understand how water could be supplied without some pressure; and the word "pressure" was not used in section 37. To his mind, it was plain that the water supplied by the defendants need not be constantly laid on under pressure. The point was really covered by the Wolverhampton case, where the sections were almost identical with those in the present instance.

Justice COLLINS: I am of the same opinion. The information was in these terms: "That the respondents did neglect to provide and keep constantly laid on and keep charged in the water-pipe situated in the East End Road, Finchley, to which said pipe fire-plugs were affixed, a sufficient supply of water for cleansing the sewers and drains, and for cleansing and watering the streets, within the appellants' district." That is the summons; and it is based upon section 37 of the Act of 1847. But it is issued under section 43, which is the only section imposing a penalty. A point has been taken by Mr. Finlay that section 43 does not, in terms, impose upon the Company the duty which is set out in the information. I do not think it is necessary for me to decide this case upon that ground, though I am impressed with what Mr. Finlay has said upon the subject. I am quite clear that, even assuming the information is correctly exhibited under section 43, on the true construction of the Private Act there is no such obligation imposed upon the Company as is sought to be set up as the basis of the information. Mr. Channell has made two points, which apply to the two cases he has had to argue before us. He says there are two different sections in the Act—one compelling the Company to keep water at a certain pressure for the purpose of supplying the upper rooms of houses, and for the extinction of fire; and another obliging them to keep water constantly laid on in the pipes. Now, as to the obligation to keep it on under high pressure, which is imposed by sections 35 and 42 of the General Act, he was obliged to abandon that, in consequence of the judgment in the Wolverhampton case, which is decisive upon the point. Our judgment upon the special case which relates to the use of the water for the purpose of extinguishing fires, is decided by that case. But then Mr. Channell contended that this decision had no application to the duty, imposed upon the Company by section 37, of keeping a constant supply in the pipes, because he said that "constant supply" in that section is not in any way connected with "pressure." That section is in these terms: In all the pipes to which any fire-plug shall be fixed, the undertakers shall provide and keep constantly laid on, unless prevented by frost, unusual drought, or other unavoidable accident, a sufficient supply of water for cleansing the sewers and drains, for cleansing and watering the streets," &c. Mr. Channell pointed out that there is nothing at all about pressure in that section. It seems to me that that matter also is concluded by the decision in the Wolverhampton case. In that case, the general obligation was the same. It was based upon the Water-Works Clauses Act; but the question was whether a particular section of one of the Local Acts—viz., the 40th section—had the effect of relieving the Company from the obligation (apparently under the 37th section) of keeping water supplied. The 40th section of the Act in that case was in terms the same as the 35th section of the Private Act in the present one. There was a great deal of discussion whether, under the circumstances of amalgamation, the 37th section survived unimpaired; and the Court held that it did survive. Therefore, the question was whether the 40th section relieved the Company from the obligation. In the Wolverhampton case, the words were these: "The defendants had certain mains and other pipes belonging to them in the town of Wolverhampton, and had fire-plugs affixed thereto for the supply of water for extinguishing fires, according to the provisions of the Act; yet the defendants did not keep charged with water the pipes so belonging to them"—without referring to any pressure. Therefore it seems to me as if the charge was based, not upon the 35th, but under the 37th section, which simply provides for a constant supply of water. There the Court held that the 40th section relieved the Company from any obligation to keep the water supplied as alleged in the information. It is perfectly true that the case was argued on the footing that there was either an obligation to keep it at high pressure or at no pressure at all. I do not find that, in the whole course of the arguments, the point was made that there might be an obligation to keep it without pressure, although none to keep it at high pressure. One of the points was, "that the 35th, 37th, and 42nd sections of the General Act imposed two obligations on the undertakers—first, to keep their pipes at all times charged with water sufficient for domestic use, for cleansing and sanitary purposes, and for extinguishing fires, unless prevented by frost; secondly, to keep their pipes at all times charged with water for domestic use, and for extinguishing fire, at such a pressure as to reach the top of the highest houses. This makes it clear to me that the person who was raising the points in that case had the distinction in his mind. The 40th section does not relieve the respondents from the first obligation; it only relieves them from the obligation of keeping the pipes charged with water under pressure. The Court decided that the Company were not guilty under the information. The decision in the Wolverhampton case seems to involve both the points that are raised here. But, apart from that, when one comes to look at the Act of Parliament itself, it seems that the Legislature is dealing with facts as they are—it is dealing with water which is necessarily under some pressure; and then they make a specific provision imposing a certain pressure in certain cases. That is followed by the 37th section, which, assuming some pressure, does not allude to any specific obligation; and the whole thing follows as simply as possible—it being water under some pressure. Then comes the 37th section of the Company's Act of 1872, which relieves them in terms from keeping water under pressure. The 35th section provides that the water to be supplied by the defendant Company need not be constantly laid on under pressure. Therefore, it seems to me that the obligation contemplated here was one to keep water on under pressure; and that is the obligation from which the Company are expressly relieved. This is made more apparent if you follow out the subsequent legislation; for in the Act of 1883 (it being felt that the inhabitants were placed in a difficulty through this absolute immunity on the part of the Company from supplying water under pressure), fresh legislation is introduced, and the 21st section provides that the water to be supplied by the Company need not be constantly laid on under pressure, except from and after the 1st of June. Then follow certain provisions, one of which is that the pressure shall be such only as will make the water reach a level not higher than 300 feet above Ordnance datum. It gives a right to persons to have water at constant pressure upon certain conditions, which it rests with them to conform to or not as they please. Here it is found that these conditions have not been complied with; also that there was, in fact, water at the place where the Local Board might have had it for the purpose of watering the streets, but that it was not there under pressure. If Mr. Channell's point be a good one—that the water is bound to be there, but not under pressure—it seems to me, upon the findings of the case, that he had the water, though not under pressure. It is clear that what the plaintiffs are complaining of is, not that there was no water, but that it did not come out of the stand-post. If they have no complaint based on the absence of pressure, it seems to me that this case puts them out of Court. On all these grounds, I am clearly of opinion that the decision of the Magistrates was right, and that the appeals must be dismissed with costs.

* See JOURNAL, Vol. X., p. 406.

The Loan for Gas-Works Extensions at Warrington.—It was reported by Mr. Alderman Holmes, at last Tuesday's meeting of the Warrington Town Council, that the Gas Committee had received the sanction of the Local Government Board to the borrowing of £20,000 for the extension of the gas-works. The money was to be divided into two sums of £18,000 and £2000, on different terms of repayment, for the reason that one part of the property to be erected was more perishable than the other, and consequently would be of shorter life.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

An Extraordinary Meeting of this Association was held last Thursday, at the City Terminus Hotel—Sir JULIAN GOLDSMID, Bart., M.P., in the chair—to consider and approve of the Bill now before Parliament in which power is sought to extend the borrowing powers of the Association.

The SECRETARY (Mr. R. S. Gardiner) having read the notice convening the meeting,

The CHAIRMAN said the matter they had to deal with was a very simple one, and would only detain the proprietors a few minutes. Nearly every gas company in England, except their own, had the right to issue debentures to the value of one-fourth of the paid-up capital. But the Association had always been kept in "leading-strings" upon this subject; and it was only a few years ago that they obtained the right to issue £500,000 of debentures. Directly they were issued, the shareholders rushed after them; and the general public could not obtain any. The Board had now applied to Parliament to have their power in this respect extended, so that the Association might be placed in the same position as every other gas company he was acquainted with; and Parliament, he believed, would see the application was so reasonable that they would approve of it, if the shareholders gave their consent to the Bill. Clauses 1 and 2 of the Bill merely recited the title and the previous Acts of the Association; clause 3 (which he explained) was the one providing for the extension of the borrowing powers; and clause 4 he would refer to briefly. As the shareholders were aware, in certain cases, dividends had not been claimed for many years, and never would be, because those who had the right to them had disappeared. This caused great inconvenience in the accounts; and the Directors proposed to provide, by clause 4, that dividends which remained unclaimed for ten years should be carried to the credit of the revenue account. He would, with absolute confidence, ask the approval and consent of the shareholders to the Bill. The resolution he had to propose was as follows: "That this meeting approves of the Imperial Continental Gas Association Bill now before Parliament, subject to any alterations which, with the concurrence of the Directors, may be made in the Bill in its progress through Parliament."

Mr. NEWTON seconded the motion.

Mr. J. J. RUNTZ inquired if the debentures were required for any specific purpose; and if it was the intention of the Directors to issue them to the shareholders at par, or at a higher price.

The CHAIRMAN said that he could not answer the question. The meeting was a special one; and by their Act of Parliament, they could only deal with the subject before them.

Mr. E. GOOCH remarked that the Chairman had not informed the shareholders why the Directors wished to borrow further money.

The CHAIRMAN said that he was sorry he had not made his remarks plain. Every gas company in England had the power to issue debentures to the extent of one-fourth of their capital; while the Association could only issue £500,000, which represented a little more than one-half the power possessed by other companies. They had now applied to Parliament for permission to raise by borrowing one-fourth of their capital, which would be £950,000. It did not, however, follow that this would be issued to-day, to-morrow, or next year; but it merely gave them power to do so when it was required. The reason was obvious; and every sensible business man would see it. There were occasions when contracts terminated; and therefore the capital invested in them would have to be made up either by a series of payments into a sinking fund, or else by the Directors being enabled to replace the capital provided without loss to anybody. The usual method of doing this was by merely borrowing money for a fixed period, and then replacing it at the end of the period for which it was borrowed. This was the most economical way; and it tended to maintain, rather than to diminish, the dividends, so that the proposal embodied in the Bill was for the benefit of all concerned in the undertaking.

Mr. GOOCH remarked that it might be economical to borrow money when it was wanted; but he could not see why they should make this application to Parliament before it was necessary.

The CHAIRMAN replied that perhaps the speaker did not know how long it took to obtain an Act of Parliament. But he could assure the proprietors, speaking with 20 years' experience as a Member of Parliament, that it would be wise to proceed in the matter; and he strongly advised them to approve of the Directors' proposal.

The resolution was unanimously carried; and this concluded the proceedings.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

In view of the half-yearly general meeting of the shareholders of the above Company next Friday, the Directors have issued their report on the working of the undertaking in the six months ending Dec. 31 last, with the accounts for that period. The latter show a sum of £47,803 available for division. As the price charged to consumers was advanced 3d. per 1000 cubic feet from Michaelmas last, the dividend is reduced, under the operation of the sliding scale, ¾ per cent. per annum. The Directors therefore recommend a dividend at the rate of 5 per cent. per annum on the 5 per cent. preference stock, of 11½ per cent. per annum on the consolidated stock, and of 8½ per cent. per annum on the new stock, 1881. Beyond the remarks as to the dividends, and the notification that Sir R. H. Wyatt and Mr. E. Walmisley, the retiring Directors, and Messrs. J. W. Field and Mr. F. Monier-Williams, the Auditors, will offer themselves for re-election, the report only contains an expression of regret at the continued depreciation in the value of residual products, and one of pleasure at the satisfactory carbonizing results of the past half year. Turning to the accounts, the gas-rental amounted, in the six months covered by the report, to £94,772, as compared with £86,567 in the corresponding period of 1891; meter and stove rental came to £3761, against £3633; residuals produced £20,684, as compared with £22,196; and the total receipts were £119,315, instead of £112,487. On the other side of the revenue account, coals rose from £38,826 to £45,336; while wages fell from £12,483 to £10,769—the total manufacturing expenses being £68,518, as compared with £66,536 in the latter half of the preceding year. In the distribution of gas, an outlay of £7080 was incurred, as against £6428; and the total expenses were £85,933, instead of £83,731. The balance carried to the profit and loss account, however, is now £33,381; whereas this time last year it was £28,756. The working statements show that 60,179 tons of coal and cannel were carbonized, as compared with 58,046 tons in the latter half of 1891; the make of gas being now 625,934,000 cubic feet, against 597,511,000 cubic feet. The residuals produced were: Coke, 39,096 tons; breeze, 5189 tons; tar, 617,001 gallons; ammoniacal liquor, 18,154 butts (including 462 butts purchased).

PROVINCIAL GAS AND WATER COMPANIES.

The recent arrival of the reports and accounts of various Provincia Gas and Water Companies indicates that the time has once more come round for holding the half-yearly meetings. We shall therefore, following our usual custom, give, in the next few numbers of the JOURNAL, any particulars in regard to the working of these undertakings which it may be of interest to record.

Gas Companies.

The forty-ninth half-yearly report of the Calverley and Horsforth District Gas Company, embracing the period from July 1 to December 31 last, states that the revenue from the sale of gas and from meter-rents for this period was £3072; that from residual products, £882; and from other sources, £102—making a total of £4057. The expenditure, including £1543 paid for coal and £411 for wages, &c., amounted to £2560. Of the balance, it is proposed to carry £1434 to the credit of the profit and loss account, and £62 to the renewal fund. The receipts on capital account were increased by £1400 during the half year; making the total receipts on this account, £35,000. In the same period £599 was expended on new works, &c.; making the total expenditure £38,735.

The half-yearly general meeting of the Cambridge Gas Company was held on the 26th ult., under the presidency of Mr. Dennis Adams. In their report, the Directors expressed regret that the balance available for dividend was less than that for the latter half of 1891, owing to the fall in the price of tar and ammoniacal liquor. However, notwithstanding adverse circumstances, it had not been necessary to raise the price of gas. Owing to the increase in the Company's business, the works were being extended by the erection of a new gasholder, and the provision of a meter, governor, meter-house, and coal-shed, at a cost of £18,267. Feeling reference was made to the loss the Company had sustained by the death of Mr. Charles Balls, who had been a Director since 1849, and for some years Chairman. Dividends at the rate of 10 and 7 per cent. per annum were recommended. Accompanying the Directors' report was one by the Manager (Mr. W. Duesbury), who stated that the works and plant had been maintained in an efficient condition; and that there had been a satisfactory increase in the consumption of gas. The report was adopted; and a resolution was submitted to increase the capital by the creation of 1500 shares of £10 each and the raising of £5100 on mortgage. The Secretary (Mr. W. Peed) explained the reason for asking for more capital; stating that contracts had already been entered into to the extent of upwards of £18,000. The Directors proposed to raise £10,000 at once by the sale of shares, and the balance as required. The resolution having been carried, the Company's Engineer (Mr. T. Hawksley) was requested to address the meeting as to the necessity for the extensions to the works. He stated that the increase in the manufacture of gas had recently become so great that the storeage capacity was not adequate to receive the whole of the gas they could produce in 24 hours, after deducting, of course, that which was consumed during certain hours of the day at an equal, or even greater rate than it was made. He had visited the works that morning, and found everything progressing satisfactorily. The work was being exceedingly well done; and the new tank for the gasholder would be ready for use by next autumn.

The half-yearly general meeting of the Dorchester Gas Company will be held to-day. The accounts to be presented show that a profit of £1066 was realized in the six months ending Dec. 31 last; and the Directors will recommend dividends at the rate of 10 and 6 per cent. per annum, less income-tax, on the ordinary and preference shares. This will leave a balance of about £60 to the credit of the net revenue account. There was an increase of about 600,000 cubic feet in the consumption of gas in the past six months. At the close of the business, the thirteenth annual meeting of the Dorchester Gas-Fitting Company will be held, at which a dividend of 6d. per share (about 7½ per cent.) will be recommended. This will leave an unappropriated balance of £17.

The Directors of the Malton Gas Company report that the quantity of gas sold for private consumption in the past half year shows an increase over the corresponding period of upwards of 4½ per cent. The growing demand for gas (the increase in the past five years being about 20 per cent.) calls for some re-arrangement of the plant; and the matter is now receiving the attention of the Board. A dividend is recommended for the six months at the rate of 11 per cent. per annum, after paying which there will be £531 left in hand.

The balance-sheet of the Otley Gas Company for 1892 shows profits amounting to £1668, which, with a small balance brought forward from 1891, makes £1706 available for division. A dividend of 7½ per cent. is recommended by the Directors.

The report on the affairs of the Pudsey Gas Company for the past twelve months shows that there is a steadily increasing demand for gas in the district. The price of the coal used averaged 3d. per ton less than in the previous year; but this only slightly compensated for

the loss on residual products. After deducting the interim dividend paid on Aug. 1 last, and providing for interest on bonds, there remains a balance of net profit amounting to £2667, which enables the Directors to pay a dividend for the past half year at the rate of 8 per cent. per annum on the consolidated 7 per cent. stock.

The report of the Directors of the Scarborough Gas Company, and the accounts for the six months ending Dec. 31, 1892, were presented at the half-yearly general meeting last Saturday. They showed that, notwithstanding the loss resulting from the reduced value of tar and ammoniacal liquor, the total receipts on revenue account had increased satisfactorily. The profit for the half year amounted to £6229. The balance available for division, including £1142 brought forward, was £6913. Out of this, after providing for the dividend on the preference stock, the Directors recommended the payment of the maximum dividends, less income-tax. This absorbed £5141, and left a balance of £1772 to be carried forward. For the purpose of meeting additional outlay on capital account, it has been resolved to make a fourth call of 20 per cent. upon the new stock. The quantity of coal carbonized in the half year was 10,714 tons; the residual products being 6696 tons of coke (of which 2643 tons were used), 738 tons of breeze, and 1181 tons of ammoniacal liquor. Of the total bulk of gas made and in store, 103,202,200 cubic feet were sold for private consumption, and 12,269,724 cubic feet for public lighting. The Secretary and Manager of the Company (Mr. W. J. Moon) having read the report, its adoption was moved by the Chairman (Mr. B. Fowler, J.P.); and the motion was carried unanimously,

The shareholders of the Westhoughton Gas Consumers' Company met last Thursday week to receive the report of the Directors on the working of the past half year. It stated that the total outlay on capital account since the establishment of the works was £25,550. Regarding the revenue account, the continued high price of gas coal, coupled with the very low rates obtainable for sulphate and tar, along with heavy expenses incurred in repairs on the old gasholder and the mains, had interfered very much with the profit. After writing off the ordinary working expenses and the outlay on repairs (amounting in all to the sum of £1098), there was a balance of £513, which was reduced by loans and interest payments to £424. This, added to a previous available balance of £679, made up a sum of £1103, out of which the Directors recommended a dividend at the rate of 5 per cent. per annum, less income-tax, on the amount of share capital called up (£20,617). The total receipts on revenue account were £1611. On the motion of the Chairman (Mr. W. C. Buckley), the report was adopted, and the dividend declared.

In the report to be presented to the shareholders of the Weymouth Consumers' Gas Company at their half-yearly general meeting to-morrow, the Directors express their gratification at being able to announce continued growth in the Company's business, and to state that the affairs of the undertaking are in a healthy and satisfactory condition. The better facilities now existing for distributing an abundant supply of gas over the whole of the Company's area, have caused the gas-rental to reach a much higher figure than it has hitherto done; the consumption of gas during the six months ending Dec. 31 last exhibiting an increase of 2¾ million cubic feet upon that of the second half of 1891. Following the improvement in the gas-rental, there has been an additional outlay for manufacturing purposes. This extra expenditure, coupled with the reduction in the receipts from residual products, neutralizes to a considerable extent the benefits which would otherwise have accrued from an augmented rental. The net result of the half-year's transactions has been a profit of £2179, out of which, after meeting the interest due upon the debenture bonds, the Directors recommend the payment of a dividend at the rate of 10 per cent. per annum on the "A" stock, and of 7 per cent. per annum on the ordinary shares (less income-tax); the balance to be carried forward.

The half-yearly report of the Yeadon and Guiseley Gas Company states that the total outlay on the works now amounts to £42,753. The income for the past six months was £5048; and the disbursements reached £3744. The net profits thus amount to £1304; and the Directors recommend the maximum dividend of 10 per cent. per annum on the consolidated stock (£11,725), and 7 per cent. on the new shares (£17,600).

The half-yearly meeting of the York Gas Company was held on the 2nd inst. The accounts submitted showed a balance of £6461 to the credit of the profit and loss account, and £6114 available for division. The Directors recommended a dividend of 5s. per share upon the old shares and 4s. 9d. upon the new, free of income-tax. The Chairman (Mr. J. F. Taylor), in moving the adoption of the report and accounts, stated that the balance of profit was £529 more than for the corresponding half of 1891. They had now a wider field for gas as an illuminant, and also for fuel, cooking, and other purposes. The increase in the consumption was at the rate of 7 per cent., which was partly owing to the severe weather and partly to the fact that they now supplied certain departments of the North-Eastern Railway Station. The income from residuals had been below the average; but the market returns indicated that sulphate of ammonia and tar products were likely to increase in price. The motion was adopted.

Water Companies.

The balance of profits on the working of the Calverley District Water Company during the past year, after paying an interim dividend of 3s. per share, amounts to £1086; and from this a further dividend of 3s. per share is recommended, which will leave £486 to be carried forward. No reference is made in the Directors' report to the agreed purchase of the concern by the Pudsey, Farsley, and Calverley Local Boards.

The accounts of the Camborne Water Company for the past six months exhibit a slight diminution of profit—the figure being £698, as against £724 in the corresponding period of 1891. The decrease is accounted for by an extra expenditure of £53 for cleansing and repairing one of the reservoirs. The disposable balance amounts to £776 and out of this the Directors recommend the payment of a dividend at the rate of 8 per cent. per annum on the "A" shares and £5 12s. per cent. on the "B" shares.

The shareholders of the Cambridge Water Company held their half-yearly meeting on the 27th ult., under the presidency of the Rev. Dr. Perowne. The Manager (Mr. W. W. Gray) reported that, in the six months ending on Dec. 31 last, he had laid on water to 252 premises, which produced a rental of £276 per annum. The total number of premises supplied at that date was 12,967. Dividends at the rate of 10 and 7 per cent. per annum were declared; and a balance of £3416 was carried forward.

The Directors' report and the statement of accounts of the Cleveland Water Company for the half year ending Dec. 31 last, were presented at the general meeting of shareholders last Wednesday. The only increase on capital account is an expenditure of £462 5s. 2d. on reservoirs, mains, pipes, &c. The revenue account shows that, after providing for interest, rents, and other preferential charges, there remains a balance of £2395, from which the Directors recommended the payment of a dividend at the rate of £5 10s. per cent. per annum on the original and "A" shares, and of £3 17s. per cent. per annum on the "B" shares (free of income-tax); also the addition of £250 to the contingent fund. This will absorb £2043, and leave a balance of £352 to be carried to the credit of the next account. Comparison of the figures for the past half year with those for the corresponding period of 1891, shows a decrease in receipts from water-rents of £90, while the cost of repairs and working expenses have increased. The disposable balance is less than in 1891 by £105; and the dividend is also less—the original and "A" shareholders at that time receiving £6 per cent., and the "B" shareholders £4 4s. per cent. The amount added to the contingent fund is the same.

The accounts of the Grantham Water Company for the past six months show a balance of revenue of £4617; and of this £1750 is to be applied to the payment of a dividend of 5 per cent.—leaving £2867 to be carried forward.

The report and accounts of the South Hants Water Company for the past twelve months afford evidence of contiuued progress. The rent-roll has increased by the addition of 439 houses, giving an estimated increased annual income of £585. The net increase in the year's rental is £651. The profit available for distribution amounts to £4947; and the Directors recommend the payment of a dividend of 6 per cent., free of income-tax, on the ordinary and new shares, which will absorb £3742. In view of the increase in the supply of water which will probably be required in the parish of Hound, the Directors have under consideration the construction of a reservoir on the east side of the Itchen, and they also purpose building a reservoir on a high level near the works at Mottisfont, so as to afford a supply by gravitation through the new main now being laid to Eastleigh. The carrying out of these works will effect an economy in the pumping; and obviate for the present the enlargement of the Basset reservoir.

At the ordinary general meeting of the South Staffordshire Water Company on the 23rd inst., the Directors will present their report on the working of the undertaking in the six months ending Dec. 31 last. It is stated therein that the number of additional houses supplied with water in that period was 1579; making the total 78,094. The gross amount of water-rates for the half year was £40,243, as against £39,210 in the corresponding period of the previous year. The Directors have transferred a further sum of £1000 to the depreciation fund, which now stands at £6356. After providing for interest on debenture and preference stock, and appropriating the above-mentioned £1000, the amount remaining for division (including £3543 brought forward) is £18,634; and the Directors recommend the declaration of a dividend on the ordinary stock at the rate of 5½ per cent. per annum, less income-tax. The amount of the dividend being £15,417, there will remain £3217 to the credit of the next half year.

The report which the Directors of the York New Water-Works Company presented to the shareholders at their meeting last Thursday week stated that, for the first time since the formation of the Company in 1846, the River Ouse rose in the month of October last to such a height that its waters flooded the filter-beds and wells at Acomb Landing, with the result that for a few days unfiltered flood water became mixed with the filtered water supplied to the consumers. The Directors expressed their high appreciation of the generous forbearance of the citizens during this trying period. Although they believed the particular flood was due to very exceptional circumstances not likely to recur, they had taken steps to raise the flood banks to such a height as to preclude an overflow in any similar circumstances. The Directors availed themselves of a favourable opportunity to secure additional land adjoining the Company's works at Acomb Landing on their north side, and thus made provision for future extensions and for protecting the undertaking. They recommended a dividend for the half year ending Dec. 31 last of 5s. per share on the preference shares, being at the rate of 5 per cent. per annum; of 9s. per share on the ordinary shares, being at the rate of 9 per cent. per annum; and of 6s. 4d. on the new shares 1878 and 1879, making, with 6s. 3d. paid in August, a dividend at the rate of £6 6s. per cent. per annum. The accounts accompanying the report showed receipts to the amount of £8268 for water supplied; the general expenditure being £1922, and the outlay for repairs amounting to £659. The balance brought forward was £6156; and that carried to the next account, £6320. The report was adopted; and the dividends recommended were declared.

Reduction in Price.—The Great Grimsby Gas Company have reduced the price of gas 1d. per 1000 cubic feet as from the commencement of the year. The rates are now 2s. 2d., 2s. 5d., and 2s. 8d. per 1000 cubic feet.

The Ramsgate Sea-Front Improvements.—On Saturday, the 4th inst., the Mayor of Ramsgate (Alderman W. P. Blackburn, J.P.) performed the ceremony of laying the foundation-stone of the first arch of the inclined road from the top of the West Cliff to York Street, Ramsgate; being a portion of the sea-front improvements which are being carried out from the designs and under the supervision of Mr. W. A. Valon, the Engineer to the Corporation. These works—comprising the making of a front approach to the East and West Cliffs, the construction of a new military road across the inner harbour, the building of a Custom House and Harbour Master's House, &c.—were formally commenced by the Mayor removing one of the stones on the quay, close to the Royal Hotel, on Nov. 23, 1891; and they are expected to cost about £60,000. The contractors are Messrs. W. and T. Denne.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Increased Railway Rates and the Carriage of Coal and Coke.

At the Meeting of the Birmingham City Council last Tuesday, the half-yearly report of the Gas Committee (which was summarized in our last issue) was submitted. Its adoption was moved by Alderman Pollack; and his remarks were directed mainly to the question of the changes in the railway rates. He said that some three years ago the railway companies withdrew the rebates which they had allowed to gas undertakings with sidings to their works, on the ground that they constituted a preference contrary to the provisions of the Act. Now the companies had added another burden to the Gas Committee. When the subject of the railway rates was discussed before the Board of Trade and in Parliament, it was understood that coal would be charged at the same rate as hitherto; but the companies had practically imposed an additional 5 per cent. on those rates by altering the basis upon which the charge was made. Formerly coal was carried at 21 cwt. to the ton; but now the companies charged the ton as 20 cwt. With regard to the coal contracts to Midsummer, the coal-owners had agreed to pay the extra rate; but with respect to coke sent by rail, the burden fell on the Committee. Whether the contractors paid the increased charge or the Committee, the burden fell upon the department; and, consequently, upon the gas consumer and the ratepayer. The withdrawal of the rebates amounted to a loss of £14,000 to the department; and the additional charges now made meant another burden of £6000 on the department. This £20,000 by which the railway companies profited, meant an extra rate of 2¼d. in the pound to the ratepayers of Birmingham. There was no adequate reason for the increase, seeing that the companies had been paying large dividends, and the capital value of dividends had increased of late years. Therefore he hoped that the proposition which was to be made in Parliament, limiting the power of railway companies in imposing arbitrary charges, by referring them to an independent tribunal, would be supported by the local members of Parliament, both in the interests of the Gas Department and of the ratepayers of the city. The report was adopted.

SALFORD CORPORATION GAS SUPPLY.

Increase in Salaries.

At the Meeting of the Salford Borough Council last Wednesday, there was considerable discussion on a recommendation to advance the salary of the Gas Engineer (Mr. S. Y. Shoubridge) from £600 to £720. The Chairman of the Gas Committee (Mr. Holland), in moving the adoption of the proposal, said that Mr. Shoubridge was appointed to his present position five years ago at a salary of £500 a year. At that time it was thought that the salary should be fixed at a low figure, so that they could increase it as time went on. It was clearly proved that Mr. Shoubridge had made a great advance in regard to their gas-works. They were now manufacturing 77 per cent. more gas than was produced when Mr. Samuel Hunter's salary was fixed at £700 a year. Mr. Phillips, in seconding the motion, said he considered the conduct of affairs by the Gas Committee, and the intelligence and active management shown, was every justification for an advance such as that proposed. The advance, if agreed to, would be £100 less per year than was paid to Mr. Hunter. He wished the Council to remember that none of the charge fell upon the rates. The Gas Committee were turning out thousands of pounds worth of gas; and they had justified their expenses by their past policy and results. Speaking from a business point of view, he considered the application was a sound one, and ought to be granted. Mr. Frankenburg moved, as an amendment, that £660 be substituted in the resolution for £720. This was seconded by Mr. Mandley, who considered there was a danger of spoiling a good servant by giving him advances too rapidly, and by speaking of him in unmeasured terms of praise. If Mr. Shoubridge were to leave them in a month or two, some new Manager would take his place at the original salary; and the Council would be told that he was one of the best engineers that could be found anywhere. After further discussion, Mr. Holland, on behalf of the Gas Committee, accepted the amendment; and, on a vote being taken, 32 members were in favour of it, and 13 against. The salary of Mr. F. R. Hartley, draughtsman to the Gas Committee, was increased from £182 to £200 per annum; and the salary of Mr. W. Woodward, Deputy-Manager, from £150 to £175 per annum.

Local Government Board Inquiry.

Last Thursday, Mr. S. J. Smith held an inquiry on behalf of the Local Government Board, into an application by the Corporation for sanction to borrow £13,268 for gas-works purposes. The Mayor (Mr. Alderman Keevney), the Town Clerk (Mr. S. Brown), and the Gas Engineer (Mr. S. Y. Shoubridge) attended in support of the application. It was stated that at an inquiry in 1891, the Inspector was informed that the Corporation were repairing one of the retort-houses. If their action had simply ended there, they should have paid for it out of the depreciation fund. The Gas Committee, however, saw, when they commenced the alterations, that the consumption of gas was likely to largely increase in the future; and believing that it would be more economical for the Corporation to extend the size of the house, they carried this out. The difference between the cost of the old building and the expenditure incurred in extending it, really made a capital charge of £13,268. After hearing explanations by the Town Clerk and the Gas Engineer, the Inspector promised to report their statements to the Local Government Board.

The Stockton Gas Bill.—On Friday, the 27th ult., a meeting of ratepayers was held in the Town Hall, Stockton, under the presidency of the Mayor (Major Ropner) to consider the promotion by the Town Council of a Bill to "extend the limits within which the Mayor, aldermen, and burgesses of Stockton-on-Tees may supply gas, and enable them to borrow money for their gas undertaking, and other purposes." The Mayor moved a formal resolution giving the necessary consent to the Bill. Alderman Hind seconded the motion; and it was carried with but few dissentients.

ILKESTON CORPORATION GAS SUPPLY.

The Salary of the Gas-Works Manager—The Annual Report.

A proposal of the Gas Committee to increase the salary of their Manager (Mr. F. C. Humphrys) by £40 a year gave rise, according to a local paper, to "a scene" at the meeting of the Ilkeston Town Council last Tuesday. The matter had received the careful attention of the Committee; and they considered Mr. Humphrys was well worthy of the additional remuneration. This opinion was supported by the annual report of the Committee, which showed that 5630 tons of coal were carbonized during the past year; while the quantity of gas made was above 54 million cubic feet—an increase of nearly 4 millions as compared with the previous year. When the gas-works were taken over by the Council, there was a leakage of 30 per cent.; but now, with an extension of mains, &c., the leakage did not exceed 10 per cent.—a very low standard for a colliery district. The number of consumers was 1280. The expendature was £7417 13s. 11d.; and the receipts, £9106 14s. 11d.—leaving a balance of £1692 after paying interest and providing for the repayment of loans. Taking an average of 25 towns of about the same size as Ilkeston, it appeared that, according to the last Board of Trade returns, this was the largest amount of profit made; while the price of gas in the same towns (each one being governed by a local authority) was in only four cases lower, but in twenty cases higher than at Ilkeston. There was an evident intention to get up the "scene," for handbills has been printed urging ratepayers to attend the Council meeting to prevent the proposed advance. The Town Hall was consequently crowded to excess. Mr. Mitchell strongly objected to the Committee's recommendation, and proposed a counter-motion. He thought the time was inopportune for making the increase; seeing that "there were not a dozen tradesmen in the town who could pay their way." This statement was greeted with laughter from several councillors, and applauded by the ratepayers present. Mr. Mitchell proceeded to declare that the town was on the verge of bankruptcy; and this called forth protests from various members, who threatened to leave the meeting unless the remarks were withdrawn. This Mr. Mitchell consented to do; but not until there had been a lively discussion on the subject. Speaking in favour of the increase, Mr. Fisher said he considered that a man who had put into the town's pocket £1000 was deserving of some advance in his salary; and this was the feeling of the majority of the Council, for, on the amendment being put, it only found six supporters, and the report and recommendation were adopted.

THE PROPOSED MINISTRY OF LABOUR.

It may be remembered that among the earliest notices given for public measures in the present session (see *ante*, p. 232) was one by Mr. E. Spencer, for a Bill to "Establish a Ministry of Labour, to be presided over by a Minister to be called the Labour Minister." The Bill has been printed; and we give below its principal provisions.

Clause 1 deals with the establishment of the Ministry of Labour, which is to consist of the Lord President of the Council, the Principal Secretaries of State, the First Commissioner of the Treasury, the Chancellor of the Exchequer, the Chancellor of the Duchy of Lancaster, the Secretary for Scotland, and such other persons as Her Majesty may think fit to appoint. But the Ministry is not to be entitled to act unless the President or one of the officers of State above mentioned is present. Her Majesty is to appoint any member of the Privy Council to be President of the Ministry, which is to be deemed to be established on such appointment being made.

According to clause 2, there are to be transferred to the Ministry the powers and duties vested in the Home Secretary for the regulation and administration of the laws relating to mines and factories and the appointment of inspectors under certain Acts mentioned in a schedule, and also those vested in the Lords Commissioners of the Treasury, relating to friendly societies and aids to thrift and providence among the industrial classes by the Friendly Societies' Acts. The Ministry is to undertake the collection and preparation of useful information and statistical details of subjects connected with labour in the most general and comprehensive sense of the word, in relation to the industrial, commercial, social, educational, and sanitary conditions of the industrial classes, and particularly to capital, the hours and conditions of labour, and the earnings of labouring men and women, with the view of promoting their material, intellectual, and moral prosperity. It is also specially charged to investigate the causes of, and facts relating to, controversies and disputes between employers and employees as they occur, which may tend to interfere with, or affect the welfare of, the community, and report thereon to Parliament. It is to constitute a National Arbitration Board, to which all controversies and disputes between employers and employees may, by the mutual consent of the parties interested, be referred for arbitrament under rules and regulations to be made by the Ministry; to make, or to aid in making, such inquiries, and collect, or aid in collecting, such information as may be deemed important in relation to emigration, and also to foreign pauper immigration, and the bearing of the latter on the conditions and circumstances of the native labour market; to make, or to aid in making, inquiries, and collect, or aid in collecting, information relating to State-assisted old-age pensions for the industrial classes, and report thereon to Parliament; and to establish a system of reports, by which, at intervals of not less than two years, the general conditions of production and other important conditions relating to the leading industries of the country may be learnt. It is also to obtain from other countries such information upon the various subjects committed to it as the Ministry may deem desirable. It may undertake the inspection of, and reporting upon, any schools which are not public elementary schools, and in which technical instruction, practical or scientific, is given in any matter connected with industrial subjects, and the aiding of any such school which admits such inspection, and is, in the judgment of the Ministry, qualified to receive such aid, and the aiding of any system of lectures connected with industrial subjects, and the inspection of and reporting on any examination in such subjects.

Clause 3 makes it lawful for Her Majesty to transfer to the Ministry of Labour other powers of Government departments; and clause 4 provides for the staff and their remuneration. The salaries of officials are to be determined by the Treasury; and the expenses of the Ministry are to be provided by Parliament.

The remaining clauses deal principally with proceedings of the Ministry (the President of which is not, by virtue of his office, to forfeit his right to sit in Parliament), the transfer of officers, and the construction of Acts and documents.

METROPOLIS WATER SUPPLY.

The Projected Additional Wells in Hertfordshire.

Last Thursday, a deputation from the Hertfordshire County Council—consisting of the Marquis of Salisbury, the Earl of Clarendon, Viscount Grimston, Mr. Halsey, M.P., Mr. Abel Smith, M.P., Mr. H. S. Cross, M.P., Sir J. Evans, and Sir R. Nicholson—waited upon the Home Secretary (Mr. Asquith) and the President of the Local Government Board (Mr. H. H. Fowler), on the subject of the proposals of the New River and East London Water Companies to sink additional wells in Hertfordshire.

Sir J. Evans, Deputy-Chairman of the Council, said they had gathered, from the evidence laid before the Royal Commission on the Metropolitan Water Supply, that the New River and East London Water Companies were making extensive arrangements with a view to the extension of their supply, by sinking fresh wells and deepening those now existing. This would be a great hardship to the county, as it would drain it of its natural water supply. At the time the Companies obtained increased powers, the Council did not exist; and the county was therefore unable to represent the interests of the district. He urged that it was undesirable that, pending the report of the Commission, these two Companies should be allowed to put themselves into a position so much better than that of the other Water Companies, especially as what was proposed would affect the question of the subsequent compensation which might have to be paid. He suggested that the Government might at least notify the Companies in question its disapproval of the action contemplated.

Mr. Asquith said he did not particularly approve of a Government Department making a protest or expressing disapproval, when it could not follow it up by any effective action, as the Companies might simply reply that they were acting within their parliamentary rights.

Mr. Fowler asked whether there was specific evidence that any of the towns, villages, or hamlets in Hertfordshire were suffering, in a sanitary sense, from deficient water supply.

Viscount Grimston said that St. Albans had been put to additional expense, in order to maintain an adequate water supply; and that the abstraction of the water was already causing much injury to one of the most flourishing industries of the county—the watercress industry.

Mr. Asquith said the deputation had shown undoubtedly that there was a case of considerable hardship; but that this hardship seemed to arise from two causes, neither of which was easily remediable. First, there was the general law as to the right to underground water, which, of course, affected not only Hertfordshire but the whole of the kingdom. In the second place, there was the perhaps somewhat improvident grant by Parliament of statutory powers to these Water Companies at a time when the county was not in a position, through its County Council, to take action. It was obvious that neither an alteration of the general law nor of the Special Acts of these particular Companies could be carried with retrospective effects, so as to defeat already acquired and vested rights, without compensation. He, therefore, did not think that the prospect of obtaining legislative relief was of a very hopeful character. On the other hand, if there was evidence to show that underground water, which was no more the property of the Water Companies than of any of the gentlemen present, was being abstracted to such an extent as to take away the natural and necessary supply from the towns and villages—producing sanitary inconvenience and danger—then undoubtedly a case would have been made out on which the Local Government Board would probably feel called upon to take action. If any specific case of this kind could be satisfactorily substantiated, he had no doubt the Board would take such steps as might be necessary and expedient.

Mr. Fowler said he would like the Council to make an inquiry as to the water supply of the small towns and villages in Hertfordshire. He could assure them of the hearty sympathy of himself and his Department, and also of their help, if it were proved clearly that the sanitary condition of these communities was being materially affected by the abstraction of the water. He did not suppose that either Parliament or the people of London would be disposed to approve of any scheme for obtaining an additional water supply which would operate to the serious injury of a neighbouring county.

The deputation then withdrew.

Large Increase in the Use of Prepayment Gas-Meters at Liverpool.—During the past year the Liverpool United Gaslight Company have fixed 4670 automatic gas-meters—making a total of 7270 now in use; and there are about 1000 applications on the Company's books awaiting attention.

Rejection of the Electric Light at Heckmondwike.—A poll of the ratepayers for and against the proposed introduction of the electric light into Heckmondwike has been made by the Local Board, with the following result: Against, 725; and in favour, 694. The question of adopting the light has been before the town for a considerable period, and has formed the subject of some protracted and exciting debates by the Local Board, in which debates the affairs of the Gas Company have come in for a good deal of adverse criticism. The members of the Board who have supported the project all along have been encouraged by the vote of a largely-attended ratepayers' meeting, held in October last, and which decided, by a large majority, in favour of the introduction of the light. It should be added that the number of voting papers returned unfilled was 523; showing that nearly one-fourth of the electors took no interest in the question either way.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. Kinloch Anderson, who is Convener of the Works Committee of the Edinburgh and Leith Gas Commission, last Tuesday persuaded the Edinburgh Town Council to send to the Lord Provost's Committee, for consideration, the question of whether the powers under the Edinburgh Electric Lighting Provisional Order should be transferred to the Gas Commissioners. At first sight, the proposal looks as if it were one which it would be inadvisable to entertain; but it must be confessed that Mr. Kinloch Anderson made a point in its favour in which there is much force. He said that the two Corporations of Edinburgh and Leith, when they took over the gas undertakings, entered into a co-partnery; and that, if the Edinburgh Corporation were to become suppliers of electric light, or to transfer their powers to a company, they would be practically violating the spirit of the co-partnery. They were, therefore, morally bound to offer to transfer the Provisional Order to the Gas Commission, whether or not that body might think fit to adopt it. He went on to point out that the success of the electric light in Edinburgh would affect the consumption of gas, and that gas consumers would have to pay more for their light; and, inferentially, gas consumers in Leith would have good ground for complaint. Mr. Kinloch Anderson will do the community good service if he raises the subject in the Gas Commission, without waiting for the reply of the Town Council, and obtains a remit there to consider whether they should apply for a transfer. There would then be a likelihood of any inquiry which the Gas Commission might make into the prospects of electric lighting being more intelligently carried out than it is being by the Edinburgh Corporation, who are not doing it well; so, at all events, the community would have the other side of the question presented to them. But I cannot help thinking that Mr. Kinloch Anderson's reasoning was vitiated by the condition which he assumed of the electric light succeeding. He spoke as if he was filled with the belief that it would prosper. He is free to hold that opinion; but, equally, others are entitled to differ from him. Whichever side may be right, it is certainly proper that the supposition that an electric lighting installation would not be financially successful should be looked at. It seems to me that, in the event of the Gas Commissioners taking over the Provisional Order, the greater prejudice would arise to gas consumers if it did not succeed than if it did. Experience has shown that, where a considerable amount of electric lighting has sprung up, the gas industry does not suffer, but the opposite. In that case, there would be no loss to the gas consumers. If, however, the Gas Commissioners were to become the electric lighting body, and a loss were to be incurred in the working of their installation, that loss would have to be borne by the gas consumers both in Edinburgh and Leith. If the Corporation of Edinburgh worked it themselves, and a loss was incurred, that loss would fall upon the ratepayers of Edinburgh alone. If a company took it over, the shareholders would bear the loss. In considering the subject, the Gas Commissioners would have to take the question of probable success or failure into account. Now, it seems to me that Edinburgh is not a city where a large demand for electric lighting may be expected. The undertakers would have to rely practically entirely upon domestic lighting. It is there where experience should come in; and I am sure that the experience of the Gas Commissioners is that the community of Edinburgh—largely made up as it is of the salaried official class, or of persons retired from business, who are anxious to make a brave show upon as little outlay as possible—are quick to grudge any extra charge upon their incomes. These are not the people who are likely to rush into extravagant expenditure upon lighting in any form; and where, then, is the revenue to come from? I could write more upon the subject; but I have said enough. Though not able to follow Mr. Kinloch Anderson the distance that he goes, I hail his motion as a well-timed one. It will lead to inquiry, and I hope reflection and discussion, both of which are very much needed.

As I expected, Mr. J. M. Turnbull's statements in his paper on the comparative cost of electric lighting and lighting by gas, mentioned last week, have not been allowed to pass unchallenged. A Mr. A. F. Carmichael, who seems to be connected with the electric lighting installation in the Edinburgh Public Library, wrote to one of the newspapers a communication, the burden of which was a wail that, "from the extraordinary amount of incorrect information given by Mr. Turnbull, many of your readers may be deterred from supporting electric lighting." Mr. Turnbull promptly replied through the columns of the same newspaper; and everyone who saw the two communications could not but be struck by the great difference in their nature. Mr. Carmichael, though charging Mr. Turnbull with inaccuracy, made no effort to show where the inaccuracy as regards the matter of cost lay; whereas Mr. Turnbull gave full and explicit reasons, accompanied by figures, in support of his position. I cannot now go further into the subject; but the advocate of gas had altogether the best of it.

Readers of the *Glasgow Herald* who take an interest in gas matters must have been highly interested on Tuesday, when they read a reply by Mr. W. Young, of Peebles, to the letter by Mr. D. M. Nelson, referred to in last week's "Notes." Mr. Young called upon Mr. Nelson to refer his readers "to a practical process, on a commercial scale, which would use the same class of oils, and produce results within even 20 per cent. of those got by the Peebles process." He invited Mr. Nelson to visit Peebles, and satisfy himself as to the production of coke; and meantime he sent him a sample of the coke. Then he concluded by asking to be informed "where the process for the direct distillation of shale into gas could be seen; the names of the shale and coal used, with their respective costs delivered at the works, yields of gas per ton, and value of the residual products; the cost for labour, purification, and disposal of the refuse from the shale; and, in actual figures, how the cost was brought out to be 9½d. per 1000 cubic feet in the holder." Mr. Nelson's reply, published to-day, states that, "while the process to which I referred is sufficiently advanced to yield very reliable data to enable me to confirm what I have said of it, it is not quite ripe for publication in the newspaper press. Mr. Young, as an inventor, will appreciate what I mean; and, further, that it must form the

subject of a paper at one of our Gas Managers' Associations prior to publication generally." So far Mr. Nelson is within his rights. Everyone, probably not excepting Mr. Young, will be delighted to hear that a process is about to be brought out which will have the effect of greatly cheapening the production of gas; and that there is a prospect of this year's meetings of gas managers being of more than usual interest—inasmuch as two positively new processes are to be laid before them. I hope Mr. Carlow will be able to secure them both for the North British Association. If he can, the Dundee meeting this year will be a memorable one. It is open, however, to anyone to ask Mr. Nelson why, when his process is not ready for publication in the press, he should have himself adopted that very method. He has not, it is true, divulged his process; but neither was Mr. Young's revealed in the *Glasgow Herald* article. Mr. Nelson's letters, however, call attention to the process in a way which will lead to inquiry, and probably discovery, before the time, which may not do the inventor of the shale process any good. There was no call upon Mr. Nelson to interfere, when all that he had to complain of was merely the statements that "the results obtainable are reliable and far in excess of those shown by any other process," and "all the oil must be converted into gas or into coke." The first statement was true, so long at least as Mr. Nelson's invention is not ready to be put into use; and Mr. Nelson's duty was to have waited, as Mr. Young did, till his process was ready for promulgation, and then to have brought it forward, when it would have received the same attention as Mr. Young's has. To return to Mr. Nelson's letter of to-day, he goes on to say, with reference to Mr. Young's process, that nothing is stated as to the cost of fuel—"rather an important element in oil gas making." Then occurs this paragraph: "I have to thank Mr. Bell, of the Peebles Gas-Works, for sending me a bag of the coke produced. Having tried several pieces of it on our ordinary fires, I can only say that it does not burn, but rather neutralizes the proper combustion of the ordinary coal. Of course, I have not tried a 'blower' to stimulate its action; but some such help is required for it to become fuel. There is not, curiously enough, in it evidence of what I contended for—that oil into coke I do not understand, for the reason that it is better into gas, and paid for at the meter as such. It is not the business of a gas manager to make coke." Then he expresses a desire that Mr. Young may succeed; and praises him very heartily for the great improvement he has effected, and may yet effect. Notwithstanding the concluding remark, there is a touch of ill-nature in the passage about the coke which it is difficult to account for. Mr. Nelson's failure to burn it is inexplicable, because it meets with a ready sale in Peebles, where, as I understand it is used in drawing-rooms, it is not likely that "blowers" will be employed to stimulate its action. I think it may be the kindest thing to Mr. Nelson to say no more on the subject, unless he stirs it up again.

A newspaper controversy, very amusing to outsiders, has arisen in Edinburgh over a lecture on the subject of "Electricity in Our Homes," by Mr. E. A. Browning, the representative in Scotland of the Brush Electrical Engineering Company, which was recently delivered to the members of the Edinburgh Literary Institute. The correspondence was started by a complaint by Mr. Robert Hammond, writing from London, to the effect that Mr. Browning's lecture was "nothing more nor less than a shameless and flagrant excerpt from my book, published in 1884, as the cream of a number of lectures that I myself had delivered in different parts of the country during the previous two years." Mr. Browning, in reply, stated that the basework of his lecture was to be found in a pamphlet issued by the Brush Company about 1884 or 1885; and he unkindly remarked that he had a far better master than Mr. Hammond—viz., experience—and that he needed no inspiration from Mr. Hammond, whose personality was unknown to him except by unfavourable hearsay, and of whose book he now heard for the first time. Mr. Hammond returns to the matter to-day; and in double columns, he shows that the quotations from the lecture are in language which is all but identical with passages from his book. Can it be that Mr. Hammond intended to swoop down upon Edinburgh with his lecture, but has been cut out by Mr. Browning? He says that his book is out of print, and is not now on sale; therefore he could have suffered little wrong by a recapitulation of its contents. That is, however, his affair. He was certainly right in protecting himself, if he thought he was injured; but does the incident not just show either that both gentlemen derived their knowledge from a common source, or that there is not a particularly nice code of honour among electricians? The only other theory which could account for the similarity of ideas and expression is that of common inspiration, which need scarcely be taken into account.

The clerks and foremen in connection with the gas undertaking in Edinburgh held their first social meeting on Thursday night. About 200 ladies and gentlemen—among whom were several members of the Gas Commission and Mr. R. Mitchell, the Engineer—were present. Mr. John S. Gibb, the Treasurer to the Commission, presided, and addressed the gathering shortly. The entertainment took the form of a concert, in which nearly all the performers were drawn from the ranks of the employees; and it was most enjoyable.

The Opposition to the Accrington Gas and Water Company's Bill.—At meetings of ratepayers held during the past week in Accrington and the surrounding towns served by the Accrington Gas and Water Company, resolutions were passed giving the various local authorities power to oppose the Company's Bill now before Parliament.

The Sulphur Clause in the Crystal Palace Gas Bill.—At the Lewisham District Board of Works last Wednesday, the Works Committee reported that they had considered the Bill promoted by the Crystal Palace District Gas Company, authorizing the raising of additional capital, and, among other matters, proposing that the gas supplied by the Company shall not contain more than 30 grains of sulphur in any form in 100 cubic feet. The Committee thought no increase ought to be sanctioned; and they directed the Clerk to ascertain what steps the London County Council were taking in the matter. The Clerk said the Council had decided to oppose the Bill; and they considered that the Company should, in regard to sulphur, be put upon the same footing as other gas companies.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 11.

Sulphate of Ammonia.—More demand is springing up; and consequently the market is hardening. Some parcels—mostly second hand—changed hands early in the week at £10 7s. 6d. f.o.b. Hull and Leith. But there are now buyers at £10 8s. 9d.; while makers are firm at £10 10s., and the latter price has in some instances been paid. There are several large orders for February and March delivery on the market; but meanwhile the prices asked are checking business. In view, however, of the extremely small quantities available, sellers are bound to realize eventually more money. The continuance of open weather points to an early season. The nitrate market remains very firm.

LONDON, *Feb.* 11.

Tar Products.—Very little new business is reported. The withdrawal of buyers from the benzol market has reduced values seriously. There appears to be a determined effort to depress the lighter tar products. With the prices at present quoted, carbonizers must be having a bad time. Anthracene is firm at former prices. Carbolic and cresylic acids are both quoted at less money. But it is unlikely that makers will accept the low prices now offering, especially as the consumption for sanitary purposes is likely to be larger than ever—cholera having unexpectedly developed itself at points which practically cover the whole of Southern Europe, and this notwithstanding the severity of the weather. Buyers of tar are rueing the high rates which were paid a few weeks since in the hope that prices generally were then going to advance. Prices are as follows: Tar, 11s. to 13s. Pitch, 27s. Benzols, 90's, 1s. 8d., nominal; 50's, 1s. 5d., nominal. Solvent naphtha, 1s. 2d. Toluol, 1s. 5d. Crude benzol naphtha, 30 per cent., 8½d. Creosote, 1¼d. Creosote salts, 20s. Carbolic acid, 60's, 2s. 3d.; 70's, 2s. 6d.; crystals, 8d. Cresol, 1s. 10d. Anthracene, 30 per cent., "A," 1s. 2d.; "B," 10d., nominal.

Sulphate of Ammonia.—Buyers pretend to be indifferent; but with the increased price and scarcity of nitrate of soda the price of sulphate is bound not only to be maintained, but, if its nitrogen value is taken into account, is sure to see a considerable advance. A steady business has been done at prices ranging between £10 6s. 3d. and £10 10s., less 3½ per cent. discount. Gas liquor is quoted at 7s. to 8s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Only a very indifferent demand continues to be reported throughout Lancashire for all descriptions of fuel; and although many of the collieries are not working more than three to four days per week, and few are actually on what may be termed full time, supplies are considerably in excess of requirements. The better qualities are, for the time of the year, only moving off slowly; and in a good many cases, lower figures are being quoted, whilst special prices are frequently accepted to clear away surplus quantities. The average quotations, at the pit mouth, are about 12s. to 12s. 6d. for best Wigan Arley; 10s. to 10s. 6d. for Pemberton four-feet and second qualities of Arley; and 8s. to 8s. 6d. for common house-fire coals. The lower qualities of round coals show no improvement whatever in the demand; and the outlook as regards the contracts for gas requirements and locomotive fuel, are anything but encouraging, so far as colliery proprietors are concerned. Nominally, ordinary steam and forge coals are still quoted at 7s. per ton at the pit mouth; but where anything like quantities are concerned, special prices have to be accepted, which in many instances are considerably below this figure. The shipping demand also continues very dull; and steam coals scarcely average more than 8s. to 8s. 6d. per ton delivered at the ports on the Mersey. At the pit mouth, burgy averages 6s. to 6s. 3d.; best slack, 4s. 9d. to 5s.; medium, 4s. to 4s. 3d.; and common, 3s. to 3s. 6d.

Northern Coal Trade.—The coal trade of the North-east continues dull, with a drooping tendency in the price of many kinds of coal. At the same time, the opening of certain of the ports that had been closed by ice has somewhat increased the shipments of coal, so that the collieries are working rather fuller time than they were. Best Northumbrian steam coal is quiet; and to secure orders, concessions in price have been made by some of the producers. From 8s. 6d. to 8s. 9d. per ton f.o.b. is the current price; but the large contract for the Swedish State Railways has been taken by Sunderland and Newcastle firms at prices that, after allowing for the freight, are considerably below that named. Second-class steam coal is 8s. per ton, less discount. Small steam coal is dull at from 2s. 9d. to 3s. 3d. Bunker coals are depressed; and prices are still weaker, from 6s. 3d. to 6s. 6d. being quoted. Gas coal is scarcely so fully sold for inland use; but the exports are rather heavier. Some of the large gas companies are endeavouring to arrange contracts for three years' supplies—an indication that they believe that the lowest range of prices has been reached. About 6s. 3d. to 6s. 9d. per ton f.o.b. is now quoted for Durham gas coals. Coke is rather easier—some of the blast furnaces in the North-west being now damped down. For export, 15s. per ton is asked. One or two contracts for gas coke have been lately concluded; but the price has not been allowed to transpire. It is certain the owners of Durham collieries are about to claim a reduction in the wages of the miners, which the lower prices justify.

Scotch Coal Trade.—The coal trade in Scotland gets worse every week. The Baltic ports are still closed; and, as a consequence, stocks are accumulating heavily in the eastern district. Almost every colliery-siding is filled with loaded waggons, for which there is no outlet; and, following upon that, in many instances the miners are only working half time. In the West, a meeting of coalmasters is called for Monday, to consider a proposal to reduce wages by 10 per cent. further. A week or two more will tell whether there is likely to be a revival, because the Continental trade should then be fully opened up. As, however, it was late in closing last year, it may take some time to get into shape. Meanwhile prices are receding; and shipments are not showing much elasticity. Main is quoted at 6s. 6d. per ton f.o.b. Glasgow (the lowest yet reached at this time); ell, at 7s. 3d.; splint, at

7s. 3d. to 7s. 6d.; and steam, at 8s. 9d. The shipments for the week amounted to 100,892 tons—an increase of 11,829 tons over the preceding six days, but a decrease, as compared with the corresponding week of last year, of 8531 tons. For the year to date, the total shipments have been 464,443 tons—a decrease as compared with the same period of last year of 31,922 tons.

Fires Caused by Gas and Paraffin Lamps in London.—According to the report of the Chief Officer to the Fire Brigade Committee of the London County Council for the past year, there were 255 fires caused by gas, while only one resulted from electric lighting. The upsetting of lamps was responsible for 233 fires; and 138 were brought about by others which were not overturned—making a total of 371 fires due to the use of lamps.

The Dawsholm Gas-Works Extensions.—Messrs. R. Laidlaw and Son, of Glasgow and London, have received orders from the Glasgow Corporation Gas Commissioners for four Beale's exhausters, each to pass 100,000 cubic feet of gas per hour, with two engines combined, also for two station meters, each capable of passing 150,000 cubic feet of gas per hour, to be erected at the new extension of the Dawsholm Gas-Works. The firm have already erected, at the Dawsholm, Dalmarnock, and Tradeston works of the Corporation, several sets of exhausters and station meters similar to the above.

Improvements at the Maldon Gas-Works.—The works and distributing system of the Maldon Gas Company are being put into thorough working order, under the direction of Messrs. Stevenson and Burstal. The mains and services have been completely overhauled, at a cost of upwards of £1000; and this work has been badly needed for some time past. During the last seven years, from 30 to 35 per cent. of the gas made has been lost by leakage; and it is now estimated that the unaccounted-for gas will not exceed 5 per cent. Improvements are being carried out at the works by Messrs. A. Williams and Co., whose tender amounted to £1101.

Carlisle Gas and Water Works Benefit Society.—The annual *soirée* of this Society was held at the gas-works last Friday. After tea, to which about 200 of the workmen and their friends sat down, the chair was taken by the Mayor (Mr. J. A. Wheatley); Mr. J. Hepworth, the Corporation Gas and Water Engineer, and other officials, being present. The Mayor commended the objects of the Society, and stated that it had been in existence for 21 years; that the amount paid during the past year to sick members, to the representatives of deceased members, and for medical attendance, was £93; that the total amount paid since the formation of the Society was £751; and that the balance now in hand was £373. During the evening an enjoyable concert was given.

Proposal to Purchase the Ipswich Gas-Works.—At the meeting of the Ipswich Town Council last Wednesday, Mr. J. Robinson moved—"That, in the opinion of this Council, the Ipswich Gas-Works should be purchased by the Corporation; and that a Special Committee be appointed to report thereon." He said he attributed it to a misunderstanding on the part of the people that the gas-works were not purchased on the former occasion when the question was before the public. He proposed this resolution because the profits on gas went to the reduction of the rates, and because corporations ought to have the control of undertakings of this description. He quoted, in support of his proposition, the profits made from the sale of gas by the Corporations of Oldham, Belfast, Bolton, Manchester, Birmingham, Coventry, and Nottingham. The motion failed to find a seconder; and therefore it fell to the ground.

St. Pancras Electric Lighting.—At the St. Pancras Vestry, last Wednesday, Mr. Sweet, Chairman of the Electricity Committee, in moving the adoption of that Committee's accounts for the year ending Dec. 31 last, stated that the Committee began with one customer only, who was not ready to receive the light as early as they could supply it. The result, however, of the first year's working was a total income of £11,003. Certain preliminary and the entire working expenses were £8428. Hence there was a profit balance of £2575. This, however, would not cover the payment of interest on, and part of the principal of the loan of £100,000 incurred as the initial cost in effecting the installation. On the whole, there was a deficit of £1500. Mr. Sweet pointed out that, unlike a private commercial company, the Vestry had to pay interest on capital from the commencement of the undertaking. Dr. Walter Smith, in seconding the motion, said he regarded the first year's working as a splendid success. The Vestry Clerk (Mr. T. Eccleston Gibb) stated that for the £21,000 the Electricity Department borrowed from the Vestry it had paid £901 interest. It was estimated that, if the income derived from the electric current were £10,000 a year, this would more than cover all necessary expenses. There was every reason to believe that the revenue would considerably exceed £10,000 per annum. The motion was adopted unanimously.

Arbitration Proceedings in Regard to the Great Malvern Water-Works.—An arbitration has lately taken place as to a claim made by Mr. C. M. Berington against the Great Malvern Local Board for compensation in respect of certain land taken from him for the construction of a reservoir. The Arbitrators were Mr. E. E. Edwards and Mr. A. Buck; the Umpire being Mr. F. T. Galsworthy. Mr. A. Young appeared for Mr. Berington; Mr. Claude Baggallay represented the Local Board. It was stated, on behalf of the claimant, that the reservoir in question was at the head of a valley, against the slopes of which three sides of it would be constructed. The fourth side, which was nearest to Mr. Berington, or, at all events, close to his farm-house and buildings, consisted of a dam. Two-thirds of the site of the reservoir and the whole of the dam would be on property which, before the passing of the Malvern Water Act of 1891, by which the new works were sanctioned, belonged to him. Mr. H. H. Cave said he thought the claimant should be paid £1250 for the damage sustained in the direction of the farm; other matters bringing up the total to £8248. Mr. R. C. Driver's figures were £6300; but, in addition, he considered that something should be paid for the work necessary for keeping the conduit clean, and for scouring the reservoir and pipes. On behalf of the Local Board, Mr. D. Watney said his total valuation was £1190; Mr. G. Mathews gave £1149 as the figure; and Mr. W. T. E. Fosbery £1060. The Umpire has reserved his award.

New Water-Works for Carmarthen.—The Carmarthen Town Council last Tuesday determined to apply to the Local Government Board for permission to borrow £12,000, for the purpose of carrying out a new water scheme; the condition of the water supply at present being very unsatisfactory.

Consulting Water Engineers and the Gainsborough Artesian Well.—The Water Committee of the Gainsborough Local Board having undertaken to supply the district with water from the artesian well, which has already been bored to the depth of 1200 feet, are seeking the advice of an eminent water engineer as to the best mode of spending the £8000 which they have the sanction of the Board to borrow for this purpose. Mr. Maxwell, of Hull, has been consulted, but declines the responsibility; and Mr. Hawksley's views, who has been consulted with regard to the water supply generally, do not coincide with those of the majority of the Committee. Mr. Jabez Church, of Westminster, has now been invited to inspect the locality, and report upon the question.

Gas v. Electric Light in Dublin.—A correspondent of the *Irish Times*, a Dublin citizen, recounts as follows his experience and opinion of the electric light: "I started to burn it on Oct. 21 last; and a few days ago received a bill up to and ending Dec. 31, 1892, for the amount of £5 10s., or about 12s. a week. This is not all. Fearing the light might prove fickle, I kept on the old gas-fittings; and I have burned a couple of pounds' worth of gas in the same period. The conclusion I have come to is that it is a fine light for the spring, summer, and early autumn—clean and handy. But it is too dear; and, worst of all, is too cold. It perishes a small business house, and injures goods which require heat. It may be all right for large business houses, banks, and institutions; but a house with a 20-feet frontage is much better without it. To keep my place warm, I had to erect a gas-stove; and if the Alliance Company came down a little in their price, electric light would only be used by people who can afford to buy coals in ship loads. My advice to shareholders in gas companies is to stick to their shares, no matter what people say of electricity being the light of the future. The future light is cheap gas."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 281.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	17½–18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c	10	11½–12½	..	6 0 0
300,000	100	3 Jan.	5	Australian (Sydney) 5 % Deb.	100	104–106	..	4 14 2
100,000	20	30 Nov.	8	Bahia, Limited	20	11–12	..	13 6 8
200,000	5	16 Nov.	7½	Bombay, Limited	5	5¾–6¼	..	6 0 0
40,000	5	,,	7½	Do. New	4	4–4½	..	6 13 4
380,000	Stck.	12 Aug.	11½†	Brentford Consolidated	100	215–220	..	5 4 6
180,000	,,	,,	8½†	Do. New	100	168–173	+3	4 18 3
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	41–43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	103–106	..	4 14 4
320,000	20	29 Sept	11½	British	20	42–44	..	5 2 3
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19–20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14½–15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7–8	..	—
200,000	100	3 Jan.	6	Do. 6 p. c. Deb.	100	99–101	+1	5 18 10
150,000	20	12 Aug.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	242–247	..	5 5 3
165,000	,,	,,	10	Do. New do.	100	180–185	..	5 8 1
160,762	,,	15 Dec.	4½	Do. 4½ p. c. Deb. do.	100	122–127	..	3 10 11
800,000	Stck.	15 Dec	13	Continental Union, Limited	100	227–232	..	5 12 0
200,000	,,	,,	10	Do. 7 p. c. Pref	100	190–195	..	5 2 7
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185–190	..	5 5 3
486,090	10	27 Jan.	10	European, Limited	10	20–21	..	4 15 3
354,060	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,596,560	Stck.	10 Feb.	12	Gaslight & Coke, A, Ordinary	100	229–225*	+1	5 6 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	93–96*	..	4 3 4
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	258–263*	..	3 16 1
60,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	115–120*	+1½	4 3 4
30,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	165–170*	+2½	4 8 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	163–167*	+½	4 3 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	257–262*	..	3 16 3
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	151–156*	..	3 16 11
1,061,150	,,	15 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	125–130	..	3 9 3
908,000	,,	,,	6	Do. 6 p. c. do	100	165–170	..	3 10 6
3,800,000	Stck.	16 Nov.	12	Imperial Continental	100	227–230	..	5 4 4
75,000	5	30 Nov.	6	Malta & Mediterranean, Ltd.	5	4–4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	107–109	..	4 11 9
541,920	20	16 Nov.	5	Monte Video, Limited	20	14–15	..	6 13 4
150,000	5	30 Nov.	10	Oriental, Limited	5	8–8½	..	5 17 8
60,000	5	29 Sept.	7	Ottoman, Limited	5	4–4½	..	7 7 4
166,870	10	—	2	Pará Limited	10	2–2½	..	—
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	103–107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	—	10	San Paulo, Limited	10	8½–9½	..	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	291–296	..	5 4 9
1,350,000	,,	,,	12	Do. B do.	100	242–247	+1	4 17 2
230,000	,,	,,	13	Do. C do.	100	245–250	..	5 4 0
750,000	,,	13 Jn.	5	Do. 5 p. c. Deb. Stk.	100	143–146	..	3 8 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225–230	..	5 0 0
				WATER COMPANIES.				
744,897	Stck.	30 Dec.	10	Chelsea, Ordinary	100	253–258	..	3 17 6
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	211–215	..	3 14 6
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	141–144	..	3 2 6
700,000	50	15 Dec.	8½	Grand Junction	50	107–111	..	3 16 7
708,000	Stck.	10 Feb.	11	Kent	100	276–281*	+¼	3 18 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	237–242	+2	3 18 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	195–200	+1½	3 15 0
285,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	125–130	+2	3 1 6
500,000	100	10 Feb.	12½	New River, New Shares	100	321–326*	..	3 14 5
1,000,000	Stck	27 Jan.	4	Do. 4 p. c. Deb. Stk	100	131–134	..	2 19 8
902,300	Stck	15 Dec.	6½	S'thwk & V'xhall, 10p. c. max.	100	160–165	–2	3 18 9
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	145–150	..	4 6 8
1,155,066	Stck.	15 Dec.	10	West Middlesex	100	247–252	..	3 19 5
						*Ex Div.		

† Next dividend will be at this rate.

The South Staffordshire Water Company's Bill.—The Wednesbury Town Council yesterday week resolved to oppose the Bill of the South Staffordshire Water Company, unless they consented to give the borough the same advantage in the way of water supply, and the pressure at which it was supplied, as was given to Walsall, West Bromwich, Oldbury, and Smethwick.

The Newport (Mon.) Gas-Works Benefit Society.—The eighteenth annual dinner of this Society was held on Monday last week, under the presidency of Mr. T. Canning, Engineer and Manager of the Newport Gas-Works, the Treasurer of the Society. Among those present were the Mayor (Mr. T. Jones), several members of the Corporation, and some prominent burgesses. The toast of the evening—"Success to the Gas-Works Benefit Society"—having been proposed by Mr. T. Goldsworthy, the Secretary (Mr. J. Whitefield) responded. In doing so, he pointed out that during the past year the total receipts of the Society were £192 9s. 1d.; including £127 10s. 1d. subscriptions, and £32 19s. donations. The expenditure comprised £115 17s. 6d. for sick pay and funeral money, £4 for the Infirmary, and £7 medical fees. He concluded by proposing the health of Mr. Canning. The toast was received with enthusiasm. Mr. Canning, in response, thanked the company for the spontaneity they had displayed in the reception of the toast. It was, he said, another proof of their great kindness—kindness which they showed not only in words but in deeds every day of his life.

Southwark and Vauxhall Water Company v. Arminger.—In the JOURNAL for Sept. 27 last (p. 565), a case was reported in which the Magistrate at the South-Western Police Court imposed upon the Southwark and Vauxhall Water Company a penalty of £10, and £1 a day for eight days, for neglecting to supply Miss Arminger, a confectioner, of High Street, Wandsworth, with water. The Company applied for a case, and it was granted. The matter came before Lord Coleridge and Mr. Justice Cave, in the Queen's Bench Division of the High Court of Justice, last Thursday; when Mr. R. D. Muir, who appeared for the respondent, took a preliminary objection to the appea being heard. He said the special case had been stated by the Magistrate, and after it had been returned to the High Court, and entered in the Crown paper, the appellants went to a Judge in Chambers, and obtained an *ex parte* order for the Magistrate to re-state it. By taking this course, they had abandoned the original case. Lord Coleridge said, the case having been sent up stated, the Judge in Chambers had no right to interfere. What had been done was most improper. The case would be struck out, with costs against the appellants.

The Sheffield Water Company and their late Legal Adviser.—An animated discussion took place at last Wednesday's meeting of the Sheffield Town Council upon a resolution of the Water Committee, by which it was proposed to pay £1000 to Mr. Broomhead Colton-Fox, in full settlement of all claims made upon the Corporation for professional services and payments by him for the Corporation in completing various contracts, purchases, and other matters pending at the date of the transfer of the water undertaking to the Corporation on Jan. 1, 1888, and for which he had sent in bills amounting in all to £1427. The resolution having been duly moved and seconded, Mr. Styring at once introduced an amendment, to the effect that the proceedings of the Water Committee in regard to the proposed payment be not confirmed, but that the consideration thereof should be postponed, pending a full report by the Town Clerk with reference to the facts and circumstances attending the payment by the late Water Company to Mr. Colton-Fox of sums amounting to £18,500 shortly before the transfer of the undertaking to the Corporation, and the business transacted by him on behalf of the Corporation since the transfer. The amendment was seconded by Mr. Bennett. In the course of a few remarks, Alderman Clegg said that, from what he had been told, he had not been satisfied that everything was as straightforward as it might be; and he hoped the Council would vote for further information. Aldermen Bramley and Gamble also supported the amendment, which was ultimately carried by a large majority.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

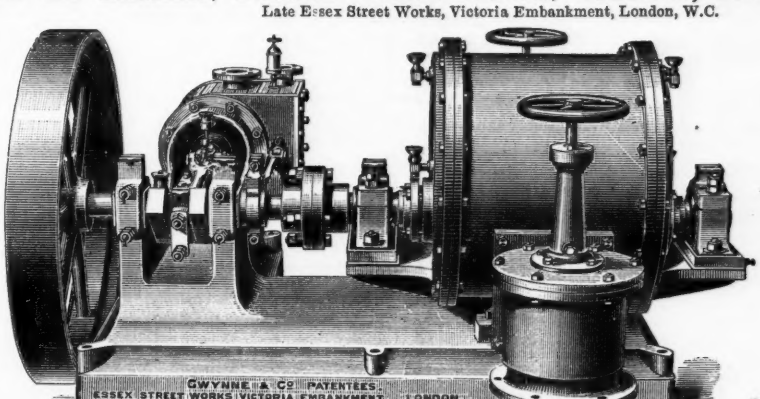
Late Essex Street Works, Victoria Embankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. III., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, Cathedral Chambers, Half Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, St. Andrew Square, Edinburgh, / Newton Grange, near Dalkeith, } Scotland.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "Porter, Lincoln."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

ADVERTISER (aged 24) desires Engagement as STOKER in small or medium Works. Good Shovel Charger, and understands Engine and Exhauster. Total abstainer.
Address No. 2194, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

£10 BONUS will be paid to any Gentleman securing Advertiser a substantial berth in Gas-Works, either as CLERK or ASSISTANT SECRETARY, or any position of trust.
Address No. 2190, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, an Engagement as Traveller or CLERK, used to Gas and Water Works Construction. Willing to travel abroad.
Address No. 2192, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, an Appointment as Assistant INSPECTOR, CLERK of WORKS, or Temporary Engagement on Gas or Water Works. Willing to go abroad. Good Testimonials.
Address No. 2191, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Situation as Draughtsman in Gas Engineer's or Contractor's Office. Has had Eight Years' experience with a well-known Firm of Gas Engineers.
Address No. 2195, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, by a competent Gas-Fitter a re-engagement as FITTER in Gas-Works or WORKING MANAGER. Used to Main and Service laying, Heating or Cooking Stoves, fixing Meters and Index reading.
Address E. Martin, 28x, Pickering Street, Essex Road, Islington, London.

WANTED, by a Gas Manager an Engagement either as MANAGER or FOREMAN. Twenty years' Experience; no objection to hard work. Manager at present Works for last Ten Years' reason for wishing to change. Engagement at home or abroad.
Address No. 2193, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS-FITTER wanted; one who can do light work at the Lathe. Permanency.
Apply to the Chandelier Department, Osler, 100, Oxford Street.

WANTED, at once, a competent Working FOREMAN for Gas-Works, making 31 millions per annum. Must be a first-class Carbonizer and fair Gas-Fitter, and have held a similar position. Total abstainer preferred. Wages, 26s. and House to commence.
Applications, with references, to be sent at once to No. 2189, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GUILDFORD GASLIGHT AND COKE COMPANY.

WANTED, at once, a competent Man, to act as OUTDOOR INSPECTOR, having a knowledge of Gas Meters, Stoves, and Mains and Services. Total abstainer preferred.
Applications, endorsed "Inspector," stating wages required, and the names of two good references, to be sent to the undersigned not later than Tuesday, Feb. 21 inst.

William Longworth,
Secretary.

Gas Offices, Guildford,
Feb. 13, 1893.

FOR SALE—Rectangular Station Meter. Capacity 19,000 cubic feet per hour; 12-inch Connections.
For particulars apply to W. E. Price, Gas-Works, Hampton Wick.

CALVERT'S MECHANIC'S ALMANAC for 1893 (price 4d.) contains, besides other valuable matter—"PATENTS: SOME POPULAR DELUSIONS," by W. LLOYD WISE, Esq., J.P., C.C., Fellow of the Chartered Institute of Patent Agents.
Manchester: John Heywood, Deansgate; and John Calvert, 99, Great Jackson Street. London: John Heywood, 2, Amen Corner, E.C.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
John Spencer, Globe Tube Works, Wednesbury; and 14, Great St. Thomas Apostle, London.

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. Chapman, Chartered Patent Agent, 70, Chancery Lane, London.

FOR SALE—A perfectly new 20,000 cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. Marsh, 41, Corporation Street, Manchester.

RETORT-BENCH MOUNTINGS FOR SALE.

IN consequence of extensions, the Stafford Corporation Gas Committee have FOR SALE the following RETORT-BENCH MOUNTINGS, which are in good condition, and will be sold cheap:—
56 Oval Retort Mouthpieces, 20 in. by 15 in., complete, with loose Steel Lids, Cross-Bars, and Screws.
56 6-inch Cast-Iron Ascension-Pipes, tapering to 5 inches diameter at top.
56 H-Pipes, 5 inches diameter inside, with three loose Caps on each.
56 5-inch diameter Dip-Pipes.
4 Lengths of Hydraulic Main, semi-circular bottom, size 25 in. by 24 in., made of ⅜-inch Wrought-Iron Plate, with ½-inch end and top Plate, each length being 19 feet long.
12 Cast-Iron Hydraulic Main Standards.
4 10-inch Gas-Valves.
13 Cast-Iron Wall Brackets for 10 inch Gas-Pipes.
10 Cast-Iron and 8 Wrought-Iron Buckstays, each about 12 feet long.
The above can be seen on application at the Gas-Works; and any further information may be obtained from the Engineer (Mr. J. F. Bell), Gas Offices, Stafford.

Matt. F. Blakiston,
Town Clerk.

Feb. 1, 1893.

BICESTER GAS-WORKS.

THE Bicester Gas, Coke, and Coal Company are prepared to LET their WORKS for the Term of Seven Years, from the 25th day of March, 1893, and hereby invite TENDERS for the taking of the same.
Applicants are requested to apply to me at my Office, in Bicester, Oxon, for the terms of letting; and sealed tenders, subject to such terms, are to be delivered to me, on or before the 4th day of March, 1893.
The Directors do not pledge themselves to accept the highest or any tender.

By order,
Gorden Walsh,
Secretary.

Bicester, Oxon,
Feb. 1, 1893.

TO IRONFOUNDERS AND RETORT MAKERS.

THE Market Harborough Gas Company ask for TENDERS for the following: 419 yards of 4-inch GAS-PIPES; 425 yards 3-inch do.; 20 lengths of 6-inch do. (turned and bored), with recess in front for lead, and to be cast vertically; together with the usual SPECIALS.
Also 30 RETORTS, BRICKS, and CLAY, particulars of which may be had from Mr. F. Armitage, Manager.
Tenders to be sent to Mr. William Gilbert, Market Harborough, by the 28th inst.

Chas. Burgoine,
Secretary.

Feb. 11, 1893.

BRIGHOUSE LOCAL BOARD.

STATION GOVERNOR.

THE Brighouse Local Board are prepared to receive TENDERS for the supply and delivery and fixing of a new STATION GOVERNOR for 24-inch Main at the Gas-Works, Brighouse.
Further Particulars and Form of Tender can be obtained on application to the undersigned.
Sealed tenders, endorsed on the outside "Station Governor," are to be sent in, addressed to Frederick Laxton, Esq., Chairman of the Local Board, Public Offices, Brighouse, on or before Tuesday, the 28th day of February, 1893.
The lowest or any tender not necessarily accepted.

James Parkinson,
Engineer and Manager.

Public Offices, Brighouse,
Feb. 10, 1893.

BRIGHOUSE LOCAL BOARD.

PIPE FOUNDERS.

THE Brighouse Local Board are prepared to receive TENDERS for the supply and delivery, carriage paid, at Brighouse Railway Station, or Calder and Hebble Canal Wharf, of a quantity of CAST-IRON GAS-MAINS and SPECIAL PIPES.
Approximate quantity—

160	yards	24-inch	dia.	Socket and Spigot	Pipes.
380	,,	20	,,	,,	,,
40	,,	18	,,	,,	,,
320	,,	12	,,	,,	,,

The Special Pipes are Governor Connections, Tees, Branches, Elbow Syphons, &c.
Further Particulars and Form of Tender can be obtained on application to the undersigned.
Sealed tenders, endorsed on the outside "Gas-Mains," are to be sent in, addressed to Frederick Laxton, Esq., Chairman of the Local Board, Public Offices, Brighouse, on or before Tuesday, the 28th day of February, 1893.
The lowest or any tender not necessarily accepted.

James Parkinson,
Engineer and Manager.

Public Offices, Brighouse,
Feb. 10, 1893.

SADLER AND CO., LIMITED, Middlesbrough; Ulverston (Barrow); Portsmouth; Carlton; Stockton; 315, St. Vincent Street, Glasgow; 10, Marsden Street, Manchester; and 85, Water Street, New York. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: Middlesbrough. Correspondence invited.

LIQUOR and Tar wanted.
Brotherton and Co., Ammonia and Tar Distillers, Leeds and Wakefield.

GASHOLDER AND TANK.

THE Directors of the Bruton Gas Company are prepared to receive TENDERS, in One sum, for a GASHOLDER and BRICK TANK according to Plans and Specifications deposited at my Office for inspection.
Tenders, endorsed "Gasholder and Tank," must be delivered to me, free of charge, on or before the 1st day of March, 1893.
The Directors do not bind themselves to accept the lowest or any tender.

By order,
Wm. Muller,
Secretary.

Bruton, Feb. 1, 1893.

THE GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £50,000 ORDINARY "A" CONSOLIDATED STOCK.
Minimum Price, £220 per cent.

THE Directors of The Gaslight and Coke Company will be prepared to receive, not later than Twelve o'clock (Noon) on Monday, the 20th of February inst., TENDERS for £50,000 of NEW ORDINARY "A" CONSOLIDATED STOCK, such Stock to be paid up in full on or before the 27th of February inst., and the Dividend thereon to commence to accrue from the 1st of March next.
Any amount, being not less than £5 or a multiple thereof, may be tendered for; and the Stock will be registered in the Company's Books free of expense.
The Minimum Price has been fixed at the rate of £220 per £100 of Stock.
Forms of Tender, with full particulars and conditions, may be obtained on application at this Office.

By order,
John Orwell Phillips,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Feb. 1, 1893.

BOROUGH OF BURTON-UPON-TRENT.

ELECTRIC LIGHT.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS from competent persons for the construction and erection of the BUILDINGS required for the Boilers, Engines, Dynamos, &c., at the proposed Electric Light Works in Wetmore Road, in the said Borough.
Full Particulars and Copies of the Conditions, Specification, and Bill of Quantities, with the Form of Tender, may be obtained and the Drawings viewed, on payment of Five Pounds (which will be returned on receipt of a *bonâ fide* Tender, with the Bill of Quantities fully priced out), on application to the Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-upon-Trent.
Sealed tenders, endorsed "Electric Light Buildings," are to be delivered to me at or before Ten a.m. on Saturday, the 25th of February inst.
The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.
No tender will be accepted from any party who pays to his or their employees, whether artizans or labourers, less than the standard rate of wages paid in this Borough, or who does not conform to the hours and conditions of labour generally recognized in each branch of industry affected; and clauses to ensure compliance with this regulation are inserted in the Conditions of Contract.

T. N. Whitehead,
Town Clerk.

Burton-upon-Trent,
Feb. 1, 1893.

BOROUGH OF BURTON-UPON-TRENT.

ELECTRIC LIGHT.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS from competent persons for the construction and erection of the WROUGHT-IRON ROOFS, &c., required for the Buildings for the Boilers, Engines, Dynamos, &c., at the proposed Electric Light Works, in Wetmore Road, in the said Borough.
Full Particulars, and Copies of the Conditions, Specification, and Bill of Quantities, with the Form of Tender, may be obtained and the Drawings viewed, on payment of Two Pounds (which will be returned on receipt of a *bonâ fide* Tender, with the Bill of Quantities fully priced out), on application to the Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-upon-Trent.
Sealed tenders, endorsed "Roofs, &c., for Electric Light Buildings," are to be delivered to me at or before Ten a.m. on Saturday, the 25th of February inst.
The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.
No tender will be accepted from any party who pays to his or their employees, whether artizans or labourers, less than the standard rate of wages paid in this Borough, or who does not conform to the hours and conditions of labour generally recognized in each branch of industry affected; and clauses to ensure compliance with this regulation are inserted in the Conditions of Contract.

T. N. Whitehead,
Town Clerk.

Burton-upon-Trent,
Feb. 1, 1893.

BOROUGH OF DEWSBURY.

THE Lighting and Water Committee invite TENDERS for the supply of RETORTS, FIRE-BRICKS, &c.

Particulars of Quantities, and Forms of Tender may be obtained from Mr. Chas. A. Craven, Engineer and Manager, Savile Town Gas-Works, Dewsbury.

Sealed tender, endorsed "Tenders for Retorts," to be sent to me the undersigned, not later than Noon on Saturday, the 18th inst.

The lowest or any tender will not necessarily be accepted.

By order,
E. MAWDESLEY,
Town Clerk.

Town Clerk's Office,
Town Hall, Dewsbury,
Feb. 9, 1893.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO RETORT SETTERS.

THE Directors of the above Company are prepared to receive TENDERS for the erection of Six SETTINGS of Six RETORTS each, at the Gas-Works, Guildford.

Tenders to include all Labour and Material required in the completion of the same, and also the coupling up to present apparatus, and to be of the same design as the present Settings, which may be inspected on application to Mr. Lloyd, Gas-Works Manager, Guildford.

Tenders to be endorsed "Retorts," and to be delivered to the Chairman of the Gas Company, Guildford, on or before Tuesday, Feb. 28 inst.

By order,
WILLIAM LONGWORTH,
Secretary.

Gas Offices, Guildford,
Feb. 11, 1893.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months or Two Years, commencing the 1st day of May next.

Tenders, for both One and Two years, and for the Tar or Liquor separately, to be sent in not later than Saturday, the 18th of February, 1893, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."

For conditions, apply to Mr. Newbigging, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any tender for the Tar or Liquor separately.

The highest or any tender not necessarily accepted.

W. FREDK. TAYLOR,
Town Clerk.

Feb. 6, 1893.

BOROUGH OF MACCLESFIELD CORPORATION GAS-WORKS.

THE Gas Committee of the above Cor-poration invite TENDERS for the construction and erection of the IRONWORK, &c., of a PURIFYING HOUSE, PURIFIERS, VALVES, and CONNECTIONS at the Gas-Works, Macclesfield.

The Drawings and Specification may be seen at the Gas-Works on application to Mr. J. G. Newbigging, Manager, and at the Offices of Mr. T. Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities and Form of Tender may be obtained from the latter on deposit of Two Guineas, which will be returned on a *bond-fide* tender being sent in.

Sealed tenders, endorsed "Tender for Purifiers, &c., Contract No. 4," to be sent so as to reach me not later than Ten a.m. on Saturday, the 18th inst.

The Committee do not bind themselves to accept the lowest or any tender.

W. FREDERICK TAYLOR,
Town Clerk.

Town Hall, Macclesfield,
Feb. 1, 1893.

TENDERS FOR COAL.

COMMERCIAL GAS COMPANY.

THE Directors are prepared to receive TENDERS for the supply of 220,000 tons of clean, dry, unscreened, fresh wrought GAS COALS, delivered f.o.b. to the Company's Steamers, at any suitable Port, during the Year ending the 31st of July, 1894.

The deliveries to be in equal monthly quantities throughout the Year.

Payment in cash monthly.

Parties desiring to tender for more than One Year must state separately the price and quantity offered for each Year.

Particulars and Forms of Contract may be obtained from the Engineer, Mr. H. E. Jones.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, sealed, and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Twelve o'clock on the 22nd of February, 1893.

Commercial Gas-Works, Stepney, E.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 3rd of March, 1893, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1892, to declare Dividends, to elect Directors, to appoint a Special Auditor, and for other purposes.

The Transfer Books of the Company will be closed from the 18th of February to the 3rd of March, both days inclusive.

By order,
W. H. HARDY,
Secretary.

Offices: 5, Great Winchester Street,
London, E.C., Feb. 11, 1893.

DARWEN CORPORATION GAS-WORKS.

RETORTS, BRICKS, CLAY, ETC.

THE Gas Committee of this Corporation are prepared to receive TENDERS for all the RETORTS, BRICKS, BLOCKS, FIRE-CLAY, &c., required at these Works during the ensuing season.

Full particulars may be had on application to
THOS. DUXBURY,
Engineer and Manager.

Gas-Works, Darwen,
Feb. 11, 1893.

HAWORTH LOCAL BOARD OF HEALTH.

THE above Local Board are prepared to receive TENDERS for the purchase of surplus TAR and AMMONIACAL LIQUOR from March 26, 1893, to March 25, 1894, delivered on Rails at Haworth Railway Station.

Tenders, marked "Tar and Liquor Tender," to be sent to me the undersigned not later than Thursday, March 2, 1893.

WM. ROBERTSHAW,
Clerk to the Board.

5, Temple Street, Keighley.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Monday, the 27th day of February inst., at Six o'clock precisely, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, to declare Dividends, and for General Business.

The Transfer Books will be closed from the 13th to the 27th of February, 1893, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: At the Works, Bromley,
Kent, Feb. 10, 1893.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 3C, Gracechurch Street, in the City of London, on Friday, the 24th day of February, 1893, at half-past Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ending the 31st day of December last, to declare a Dividend, to elect a Director and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.

The Transfer Books will be closed from the 11th to the 24th inst., both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Feb. 7, 1893.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 25th day of February inst., at Three o'clock in the Afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st day of December, 1892, to declare a Dividend, and transact such other Business as the Act of Parliament directs.

The Transfer Books will be closed from Saturday, the 11th, until Tuesday, the 28th inst.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company, Willoughby Lane,
Tottenham, Feb. 10, 1893.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given, that an EXTRAORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, E.C., on Thursday, the 9th inst., for the purpose of CONSIDERING the PROVISIONS of the BILL now before Parliament, entitled "A Bill to extend the Borrowing Powers of the Imperial Continental Gas Association." Sir JULIAN GOLDSMID, Bart., M.P., having taken the Chair, the following RESOLUTION was unanimously passed:—

"That this Meeting approves of the Imperial Continental Gas Association Bill now before Parliament, subject to any alterations which, with the concurrence of the Directors, may be made in the Bill in its progress through Parliament."

By order of the Board,
R. S. GARDINER,
Secretary.

21, Austin Friars, London, E.C.,
Feb. 10, 1893.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

55, ROBERTSON STREET, GLASGOW.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS,

Near HALIFAX,

MANUFACTURER OF SULPHURIC ACID

OF EXTRA QUALITY FOR MAKING

WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

THOMAS TURTON

AND SONS, LIMITED,

Sheaf & Spring Works,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

TAR.

GAS COMPANIES should not sell at the present low price, but use it for heating their Boilers or Retort-Settings with

WALKER'S

PATENT

SPRAY BURNER.

Its Heating Value is Twice as Great as Coke.

APPLY TO

C. & W. WALKER,

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT,

SALOP.

For **FIRE-BRICKS**, the most durable for **GAS-FURNACES**,

ADDRESS

JAMES WHITE & Co., Limited,

ALBERT WORKS, WIDNES.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Danish Gas Company of London, Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON, FITTER.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production over 3200 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¾ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over

400,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,

PARK STREET, SOUTHWARK, E.C.,

And at STROUD, GLOUCESTERSHIRE

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887 for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE.

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C

GASHOLDERS

C. & W. WALKER

Have completed a four-lift Holder nearly 200 feet high, of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.

PURIFIERS. SULPHATE PLANT.

Weck's Centre-Valve.

CLAUS' SULPHUR-RECOVERY PLANT.

PURIFYING MACHINES.

ADDRESSES:

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

10, Finsbury Square, London.

"FORTRESS DONNINGTON." "FORTRESS LONDON."—Telegraphic.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

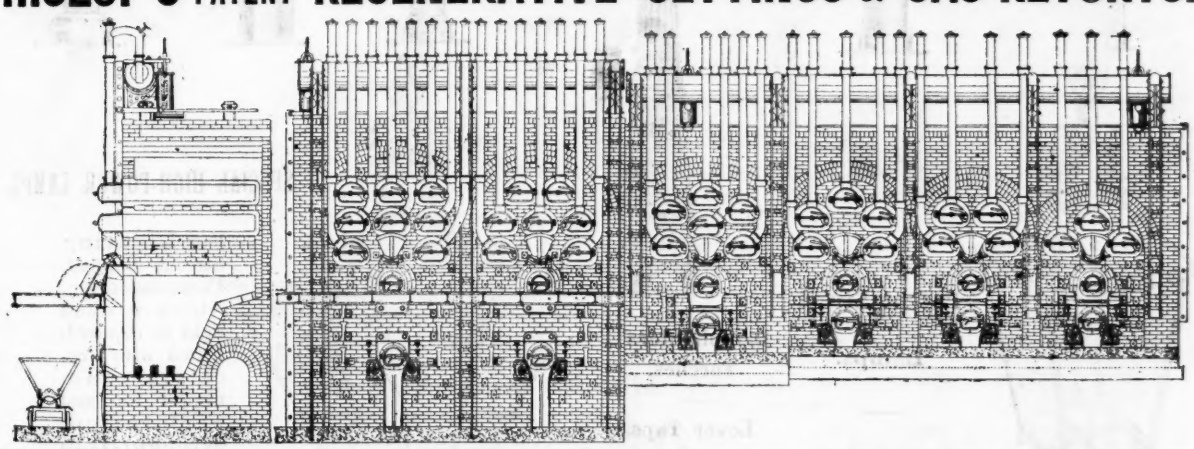
T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

NIDDRIE CANNEL
A FIRST-CLASS CANNEL COAL,
Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.
FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO
The Niddrie & Benhar Coal Co., Ltd.,
4, York Buildings, Queen Street,
EDINBURGH.
Telegrams: "BENHAR, Edinburgh."

MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.
Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from
C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings, or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non*
TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS
Under G. R. HISLOP'S PATENTS.
All Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.
Descriptive Pamphlets and Terms from Agents as above.

Gas Lamps and Posts.

Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

Patent Street Lamps.

NO PUTTY.

Lamplighters' Torches.

Lever Taps.

Lamp Governors.

PRICE LIST ON APPLICATION.

SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

GAS-METERS.

PREPAYMENT METERS

(PRICE'S PATENT)

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

D. HULETT & Co., Ltd.,

55 & 56, HIGH HOLBORN, LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

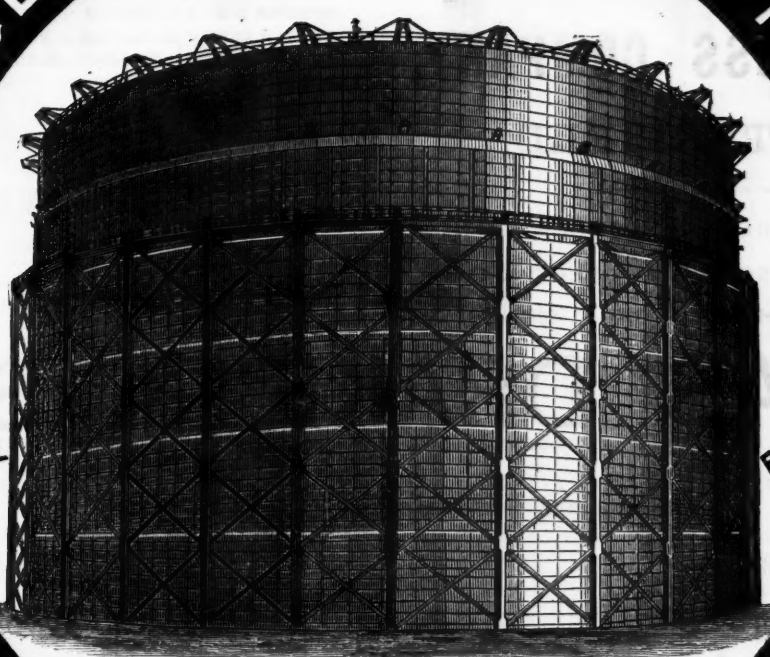
Prices and Analysis of all the Scotch Cannels on application

AUG. KLÖNNE,
DORTMUND (GERMANY).
REGENERATIVE FURNACES.
Unsurpassed in
Efficiency, Economy, Durability, and Easy Working.

ALEXANDER RUSSELL & CO.,
Cannel and Gas Coal Merchants,
53, WATERLOO STREET,
GLASGOW.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

CLAYTON SON & CO LTD
MAKERS OF
WORKS LEEDS
THE LARGEST GASHOLDER IN THE WORLD
GASHOLDERS OUR SPECIALITY



DESIGNED BY FRANK LIVESEY ESQ.
CAPACITY 12 MILLION CUBIC FT.
ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR
MAKERS OF GAS PLANT OF EVERY DESCRIPTION
ROOFS PURIFIERS &c. ALSO
ADDRESS LONDON 60, QUEEN VICTORIA ST.
TELEGRAPHIC "GAS, LEEDS."
GASHOLDERS OF ANY SIZE
ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES
AND
CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE
CLAY CROSS COMPANY,
CHESTERFIELD.

TRADE MARK.	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON" CLAY CROSS.	BECK & Co., 130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S
IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

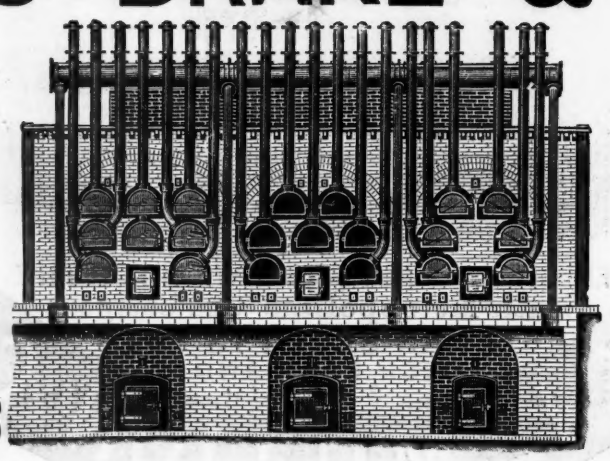
JONAS DRAKE & SON,

TELEGRAPHIC ADDRESS:
"DRAKESON, HALIFAX."

TELEPHONE No. 43.
HALIFAX EXCHANGE.

GAS ENGINEERS,
CONTRACTORS,
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS,
FURNACE BUILDERS
ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

INCLINED RETORTS

GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.

OVENDEN, HALIFAX.

DRAWINGS, SPECIFICATIONS, AND ALL OTHER PARTICULARS ON APPLICATION.

WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter,

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS.

GASHOLDERS, Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS. WASHERS, ENGINES and **EXHAUSTERS, STATION METERS** and **GOVERNORS,** manufactured and erected.

Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

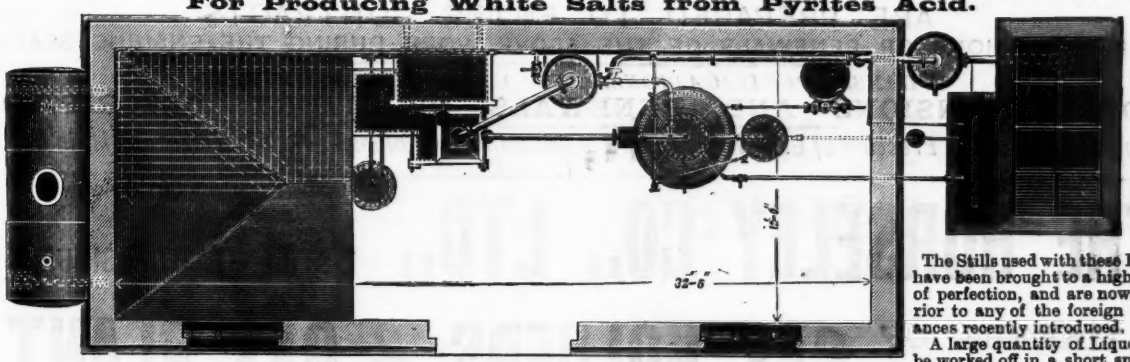
WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

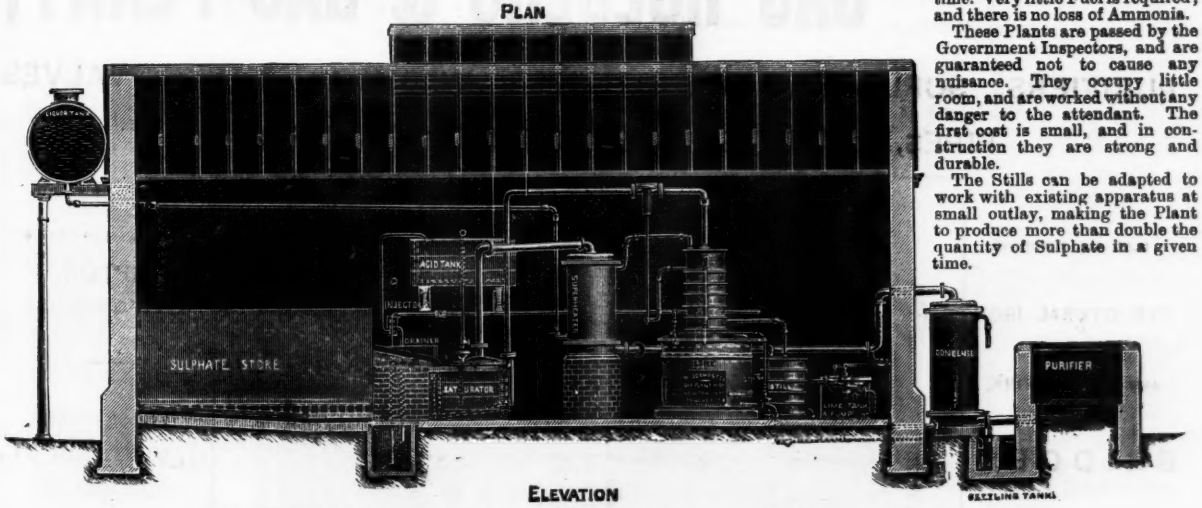
Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

SULPHATE OF AMMONIA PLANTS

For Producing White Salts from Pyrites Acid.



PLAN



ELEVATION

The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recently introduced.

A large quantity of Liquor can be worked off in a short space of time. Very little Fuel is required; and there is no loss of Ammonia.

These Plants are passed by the Government Inspectors, and are guaranteed not to cause any nuisance. They occupy little room, and are worked without any danger to the attendant. The first cost is small, and in construction they are strong and durable.

The Stills can be adapted to work with existing apparatus at small outlay, making the Plant to produce more than double the quantity of Sulphate in a given time.

FOR ESTIMATES AND ILLUSTRATIONS, APPLY TO THE SOLE MAKERS,

R. & J. DEMPSTER,

ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

LONDON OFFICES: 181, GRESHAM HOUSE, OLD BROAD STREET, E.C.

HYDRATED OXIDE OF IRON
FOR GAS PURIFICATION.

Two to three times as rich in Hydrate as Bog Ore.
STRONG ACTION ON SULPHURETTED HYDROGEN.
We have for sale Hydrate of Iron containing 77 per cent. of Ferric Oxide and 17 per cent. of Water. Directions given for mixing for Purifiers.
LESS THAN HALF THE PRICE OF BOG ORE.

APPLY TO—
READ HOLLIDAY & SONS, LTD., HUDDERSFIELD.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
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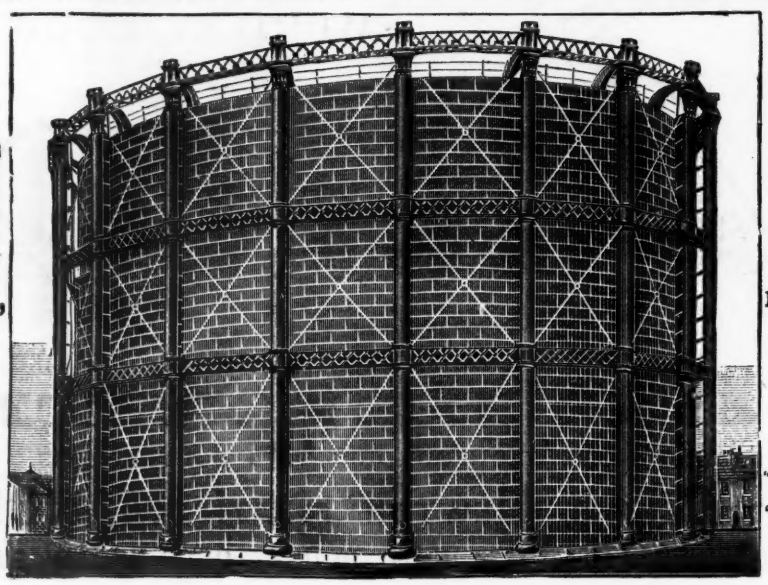

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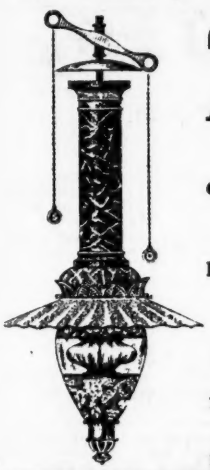

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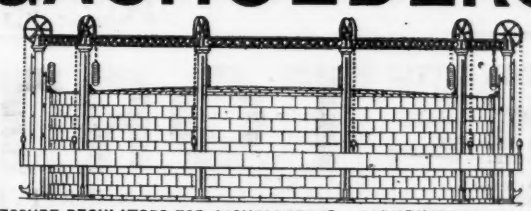

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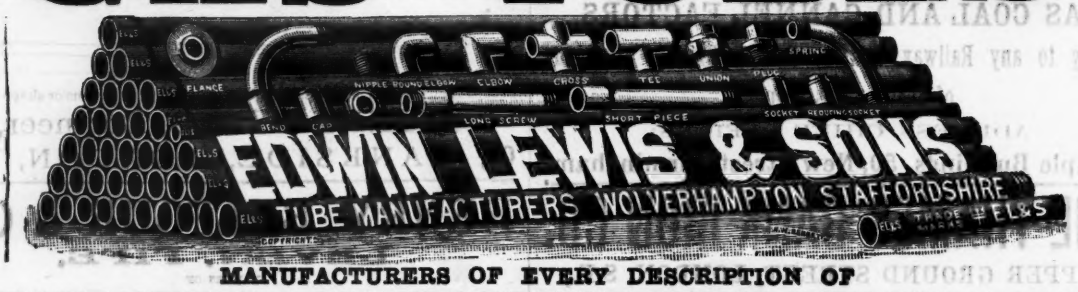

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